

SELLER/CONTRACTOR DOCUMENT REVIEW

Permission to proceed does not constitute acceptance or approval of design details, calculations, analysis, test methods, or materials developed or selected by SELLER/CONTRACTOR, and does not relieve SELLER/CONTRACTOR from full compliance with contractual obligations.

1 ☐ Work may proceed.

4 ☐ Review not required.
Work may proceed.

2 ☐ Revise & Resubmit. Work may proceed
subject to incorporation of changes.

5 ☐ VOID / Superseded

3 ☐ Revise & Resubmit. Work may **NOT** proceed.

DDR Nbr:

Reviewed by: _____ Date: _____

Discipline: _____

Document N°

Rev.:



Address : ECL, 100 Rue Chaland
59790 RONCHIN - FRANCE
Phone : +33 (0)3 20 88 70 70
Fax : +33 (0)3 20 88 70 99
Email : contact@ecl.fr

MA'ADEN

POT TENDING MACHINE

MAINTENANCE MANUAL

CLIENT Contract : 25457-4230-POA-MJKT-0001
Manual : 25457-4230-V1A-MJKT-0123

ECL Contract : P1034
Manual : 1-10-961-16

VOLUME 1/3

Date	Rev.	Written by Name and Visa	Checked by Name and Visa	Approved by (Product Manager) Name and Visa
06/2011	00	Julien PROD'HOMME	Jerome MAREE	Bernard Kaszynski
09/2011	01	Samuel DHENNIN	Mickaël GARNIER	Philippe Vincent
02/2012	02	Julien PROD'HOMME	Jerome MAREE	Philippe Vincent

TECHNICAL DOCUMENTATION COMPOSITION

Manual	Reference
Installation	1-10-960-99
Operating	1-10-961-18
Maintenance	1-10-961-16
Spare parts	1-10-961-17

SUMMARY

Chapter	Description	Volume
1	General information	1/3
2	Technical and safety data sheets (Lubricants)	
3	Preventive maintenance	
4	Mechanical maintenance	
5	Hydraulic maintenance	2/3
6	Pneumatic maintenance	
7	Electrical maintenance	3/3
8	Air conditioning units	
9	Lifting unit	
10	Verification of welds	
11		
12		

ECL CONTACTS

Address	ECL Contacts	Name	E-mail
ECL France 100, rue Chaland 59790 Ronchin - FRANCE Phone : +33 (0)3 20 88 70 70 Fax : +33 (0)3 20 88 70 99 Email : contact@ecl.fr	Project Manager	Mr F. Pereira	frederic.pereira@ecl.fr
	Product Manager	Mr P. Vincent	philippe.vincent@ecl.fr
	Technical documentation Manager	Mr B. Kaszynski	kaszynski_b@ecl.fr
	Spare Parts Manager	Mr R. Collaudin	romuald.collaudin@ecl.fr
	After Sale Services	ecl_aftersaleservices@ecl.fr	

SUBMISSIONS REGISTER

Sub N°	Manual Revision	Sending Date	Return Date	Client Status	Complete Manual			Modified Pages		
					Paper	CD rom	FTP or E-Mail	Paper	CD rom	FTP or E-Mail
01	00	15/06/2011								
02	01	08/09/2011					1			

REVISIONS MANAGEMENT

Manual Rev.	Type *	Modified pages	Page Rev.	Observations
01	A	5.28 ; chap 10	00	Manual updated
	M	FRONT PAGE, 0-2, 0-3, 3-2, 3-3	01	
02	M	Front pages ; 0-3 ; 3-3	02	Manual updated
		4-10 ; 4-11 ; 5-2 ; 5-3 ; 5-4 ; 5-5 ; 6-1 ; 6-2 ; 6-3 ; 6-16 ; 9-0	01	
	A	9-3	00	Cables certificates added

(*) M = Modified document

C = Cancelled document

A = Added document

Note: The black squares are put to localise modifications on page for last revision.

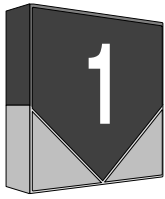
PROPRIETES INDUSTRIELLES
ET MARQUES DEPOSEES
INDUSTRIAL PROPERTIES
AND TRADEMARKS

La conception de cet équipement est la propriété de ECL et toute information le concernant dans ce document est confidentielle. Par conséquent, toute reproduction ou copie de quelque façon que ce soit de ce document et de son contenu, sans permission écrite antérieure d'ECL, est strictement interdite.

The design of this equipment is the property of ECL and all information relating to it in this document is confidential. Therefore, the reproduction or copy in any manner of this document or of the drawings and schematics herein contained without the prior written permission of ECL is strictly forbidden.

Le nom social de ECL est de propriété industrielle. Le logo ECL et les marques déposées ECL[™] et Candi[™] appartiennent à ECL et ne peuvent être employés sans permission écrite antérieure d'ECL.

ECL's corporate name is proprietary. ECL's logo and the trademarks ECL[™] and Candi[™] belong to ECL. They cannot be used without the prior written permission of ECL.



GENERAL INFORMATION

CONTENTS OF THE CHAPTER

GENERAL SAFETY AND PRECAUTIONS	1.1-1
GENERAL LAYOUT & SCOPE OF WORK	1.2-1
TECHNICAL DATA AND CONDITIONS OF SERVICE	1.3-1
MAINTENANCE ACCESS DESCRIPTION	1.4-1



1.1 GENERAL SAFETY AND PRECAUTIONS

(ECL Document 1-10-714-81 rev.03 of 08/12/2010)

1. GENERAL

The ECL's technical documentation contains important information for reliable, proper and efficient operation. Compliance with the operating instructions is of vital importance to ensure that reliability and a long service life of the equipment and to avoid any risks.

These operating instructions do not take into account local regulations; the operator must ensure that such regulations are strictly observed by all, including the personnel called in for installation.

If you need any additional information or instructions exceeding the scope of the ECL's technical documentation or in case of damage, please contact ECL's nearest customer service.

2. SAFETY

The ECL's technical documentation contains fundamental information which must be complied with during installation, operation, monitoring and maintenance. Therefore this operating manual must be read and understood both by the installing personnel and the responsible trained personnel / operators prior to installation and commissioning, and it must always be kept close to the location of operation of the equipment for easy access.

Not only must the general safety instructions laid down in this part on "SAFETY" be complied with, but also the safety instructions outlined under specific headings.

The instructions attached directly to the equipment must always be complied with and be kept in a perfectly legible condition at all time.

2.1. PERSONNEL QUALIFICATION AND TRAINING

All personnel involved in the operation, maintenance, inspection and installation of the unit must be fully qualified to carry out the work involved.

Personnel responsibilities, competence and supervision must be clearly defined by the operator. If the personnel in question is not already in possession of the requisite know-how, appropriate training and instruction must be provided. If required, the operator may commission the manufacturer / supplier to take care of such training. In addition, the operator is responsible for ensuring that the contents of the operating instructions are fully understood by the responsible personnel.

2.2. NON-COMPLIANCE WITH SAFETY INSTRUCTIONS

Non-compliance with safety instructions can jeopardize the safety of personnel, the environment and the equipment itself. Non-compliance with these safety instructions will also lead to forfeiture of any and all rights to claims for damages. In particular, non-compliance can, for example, result in :

- failure of important equipment functions.
- failure of prescribed maintenance and servicing practices.
- hazard to persons by electrical, mechanical, hydraulic, pneumatic and chemical effects.
- hazard to the environment due to leakage of hazardous substances.

2.3. SAFETY AWARENESS

It is imperative to comply with the safety instructions contained in the ECL's technical documentation, the relevant national health and safety regulations and the operator's own internal work, operation and safety regulations.

2.4. SAFETY INSTRUCTIONS FOR THE OPERATOR / USER

Guards which are fitted to prevent accidental contact with moving parts must not be removed whilst the unit is operating

Leakages of lubricants and others liquids must be contained so as to avoid any danger to persons or the environment. All relevant laws must be heeded.

Electrical hazards must be eliminated (in this respect refer to the relevant safety regulations applicable to different countries and / or the local energy supply companies)

Make sure to prevent dust from collecting in hazardous amounts on the equipment.

2.5. SAFETY INSTRUCTIONS FOR MAINTENANCE, INSPECTION & INSTALLATION WORK

The operator is responsible for ensuring that all maintenance, inspection and installation work be performed by authorized, qualified specialist personnel who are thoroughly familiar with the ECL's technical documentation.

Work on the equipment must be carried out only during standstill. The shutdown procedure described in the ECL's technical documentation for taking the equipment out of service adhered to without fail.

Maintenance, inspection or installation work can be carried out :

- If you are qualified specialist personnel.
- If the electrical components are at zero voltage.
- If hydraulic and/or pneumatic actuators are at zero pressure.
- If no hazard exists (slipping hazard, crushing hazard, ...).
- If the electrical, hydraulic and pneumatic actuators are secured against restoration of the power supply.
- If the brakes of horizontal and vertical movements are operational (or wedges installed) to avoid any untimely movements for an external (wind, shock ...) or internal (sliding ...) reason.
- If there is no more voltage on all electrical wires and non isolated conducting parts (for example: terminal boxes), to be checked with an electrical safety tester.
- With insulated tools.
- Using genuine spare parts.



2.6. DANGEROUS VOLTAGE



The equipment is connected to a main power supply. Any contact with live parts can lead to very serious injury or even death.

2.7. SAFETY INSTRUCTIONS FOR STARTING



Put into operation only :

- If you have read the operating instructions and the owner has instructed you in all details.
- If the operating instructions are available for reference at the place of operation.
- If you are qualified personnel.
- If you are not under the influence of drugs, alcohol or medication that can adversely affect your ability to react.

2.8. UNAUTHORIZED MODIFICATION AND MANUFACTURE OF SPARE PARTS

Modifications or alterations of the equipment supplied are only permitted after consultation with ECL manufacturer. Original spare parts and accessories authorized by manufacturer ensure safety protection, if applicable. It must be emphasized that spare parts not supplied by manufacturer and unauthorized accessories have not been tested and approved by the manufacturer. Installation and / or use of such products may therefore have an adverse effect on design-related properties of the equipment.

The manufacturer can not be held liable for damage resulting from the use of non-original spare parts and unauthorized accessories.

2.9. UNAUTHORIZED MODES OF OPERATION

The warranty relating to the operating reliability and safety of the equipment is only valid if it is used in accordance with its designated use as described in the ECL's technical documentation. The limits stated in the data sheet must not be exceeded under any circumstances.



WARNING

PARTICULAR SECURITY INSTRUCTIONS

THE VARIABLE FREQUENCY DRIVES INSTALLED ON ECL EQUIPMENT AND ALL PARTICULARLY THOSE USED FOR THE LOAD LIFTING FUNCTIONS SHOULD NOT IN NO CASE BE SHUNTED OR PARAMETERIZED AGAIN WITHOUT PRIOR AGREEMENT OF ECL.

3. TRANSPORT AND INTERIM STORAGE

The transport of the equipment requires proper preparation and handling.

Protect all stored goods against humidity, dirt, vermin and unauthorized access. All opening of the assembled unit components are closed and must only be opened when required during installation.

4. OPERATORS

4.1. PRODUCTION OPERATORS



- The control of the ECL equipment must be only carried out by qualified and entitled operators which must :
 - Know the safety recommendations and procedure described in the operating manual.
 - Adhere to the safety rules in effect on plant and to local regulations.
- Before control of the ECL equipment, the operator must :
 - Ensure that the machine is free, no operator is present on the machine.
 - Ensure that access conditions are correct (stop push buttons, gate, ladder, door, emergency evacuator...)
 - Visually check the conditions of the machine (faults, damages, loading) and take into account of the observations given by the operator during the last shift.
- During the control of the machine :
 - The presence of another operator on the machine is **FORBIDDEN**.
 - Carry out only the operations for which the machine has been designed by using the functions and tools as described in the operating manual.
 - Adhere to the safety rules and recommendations issued of the process in effect on plant.
 - Take into account of the message faults given by the controllers, pilot lamps, horn,... and carry out the required operations in control cabin or from the pendant box, to set the machine into use again.
 - In case of faults which cannot be immediately corrected , the operator must leave the working zone and secure the machine (loading conditions, no movement, stability,...), then he must stop the machine and advise immediately the **MAINTENANCE DEPARTMENT**.
 - The maintenance operations will be only carried out by a qualified and entitled maintenance operators adhering to the instructions specified in the paragraph hereafter "**MAINTENANCE OPERATORS**".

NOT RESPECTING THESE RECOMMENDATIONS RULES AND REGULATIONS CAN CAUSE DAMAGES OR CORPOREAL ACCIDENTS FOR WHICH THE CONSTRUCTOR "E.C.L." WILL NOT BE RESPONSIBLE.

4.2. MAINTENANCE OPERATORS

The maintenance operations for :

- Greasing and lubrication.
- Preventive maintenance.
- Checking and adjustment.
- Cleaning.
- Repairing operations.



must be only carried out by qualified and entitled operators which must :

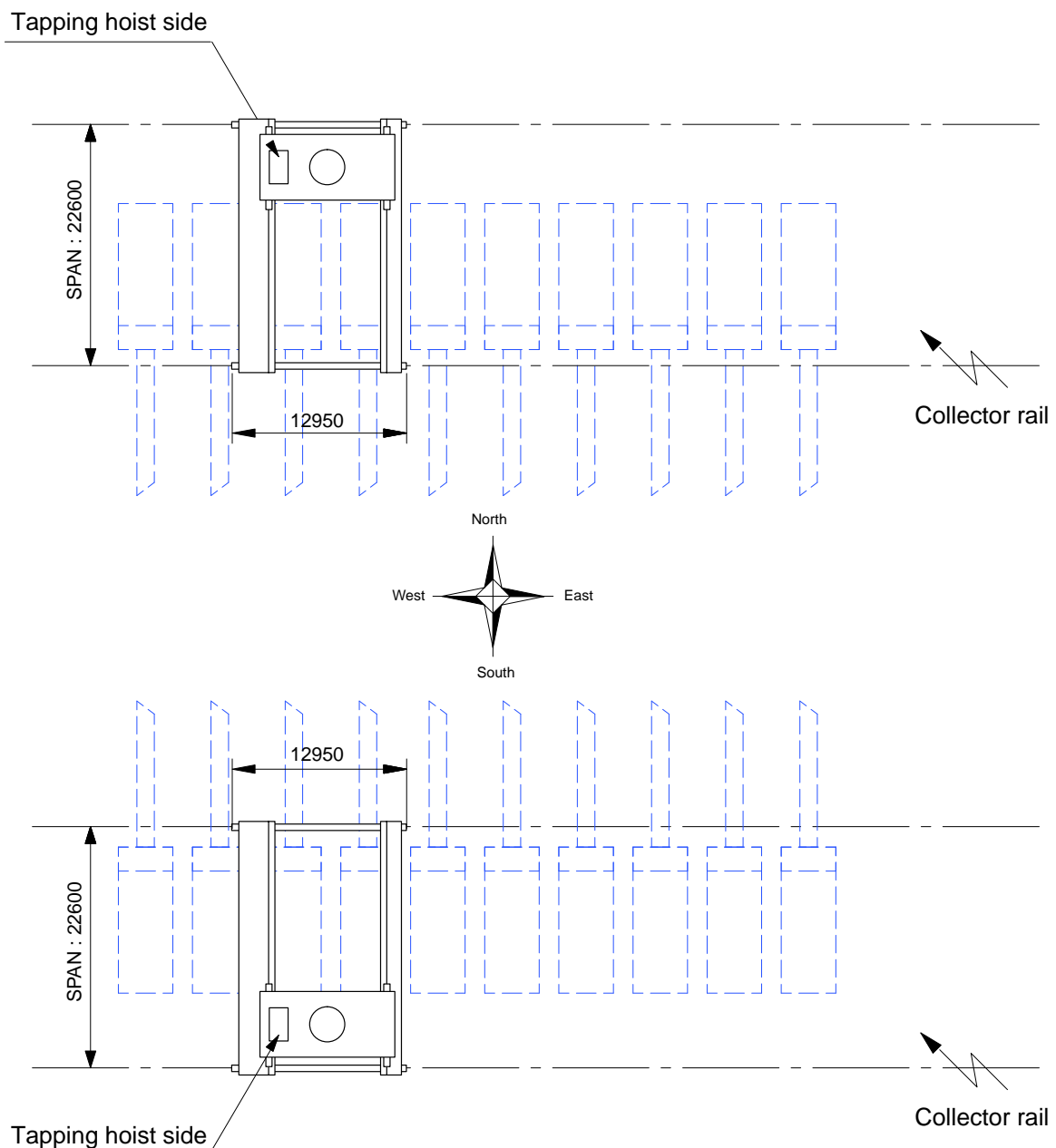
- Know and respect the same instructions which are given for production operators in the previous paragraph “**PRODUCTION OPERATORS**”.
- Know the operation of the machine as described in this operating manual.
- Know the risks inherent at every technology used in the process of the machine.
- Possess to the technical knowledges (hydraulic, mechanic, pneumatic, electric, automatic...) required to carry out the maintenance operations.
- Acced to the machine after having stopped the movement by using the access stop buttons.
- Before all maintenance operations, ensure that :
 - The machine is switched off.
 - The tools are unloaded.
 - No risk of unbalance or fall down before parts dismantling.

1.2 GENERAL LAYOUT & SCOPE OF WORK

1. PURPOSE AND USE OF THE POT TENDING MACHINE

This manual concerns the **Pot Tending Machine (PTM)**.

Figure 1 : Location of PTM



The **Pot Tending Machine** is designed to carry out the following operations :

1.1. ANODE CHANGING

- Breaking of the crust in front of the anode and also on the side of corner anodes by means of the breaking mechanism.
- Clamping of the anode by means of the extracting mechanism.
- Lowering of the wrench on the clamp actuation nut by means of the tightening mechanism.
- Lowering of the anode connector and retracting the wrench with connector by means of the tightening mechanism
- Removing of the anode by means of the extracting mechanism.
- Cleaning of the anode hole from frozen bath and small carbon blocks by means of the cleaning shovel (option).
- Picking up of a new anode and setting it on the pot at the anodic level by means of the extracting mechanism.
- Lowering of the wrench with the connector into the hook and tightening of the connector by means of the tightening mechanism.
- Retracting of the tightening and extracting mechanisms.
- Feeding of crushed bath or alumina on the new anode by means of the discharge system.

1.2. METAL TAPPING

- Tapping of metal by means of the tapping tool.
- Handling of the metal tapping crucible.
- Control of the metal weight by means of an electronic weighing device.

1.3. MISCELLANEOUS HANDLING

Miscellaneous handling operations can be carried out by means of the tapping tool and the auxilliary hoist unit.

- Handling of the anode raising beam.
- Handling of the anode with a back-up clamp.
- Handling of the anode bracket assembly without stem.
- Handling of the fallen anode.

All hook hung equipment are out of the Pot Tending Machine supply.

1.4. USE OF POT TENDING MACHINE

Some of the above mentioned operations can be controlled :

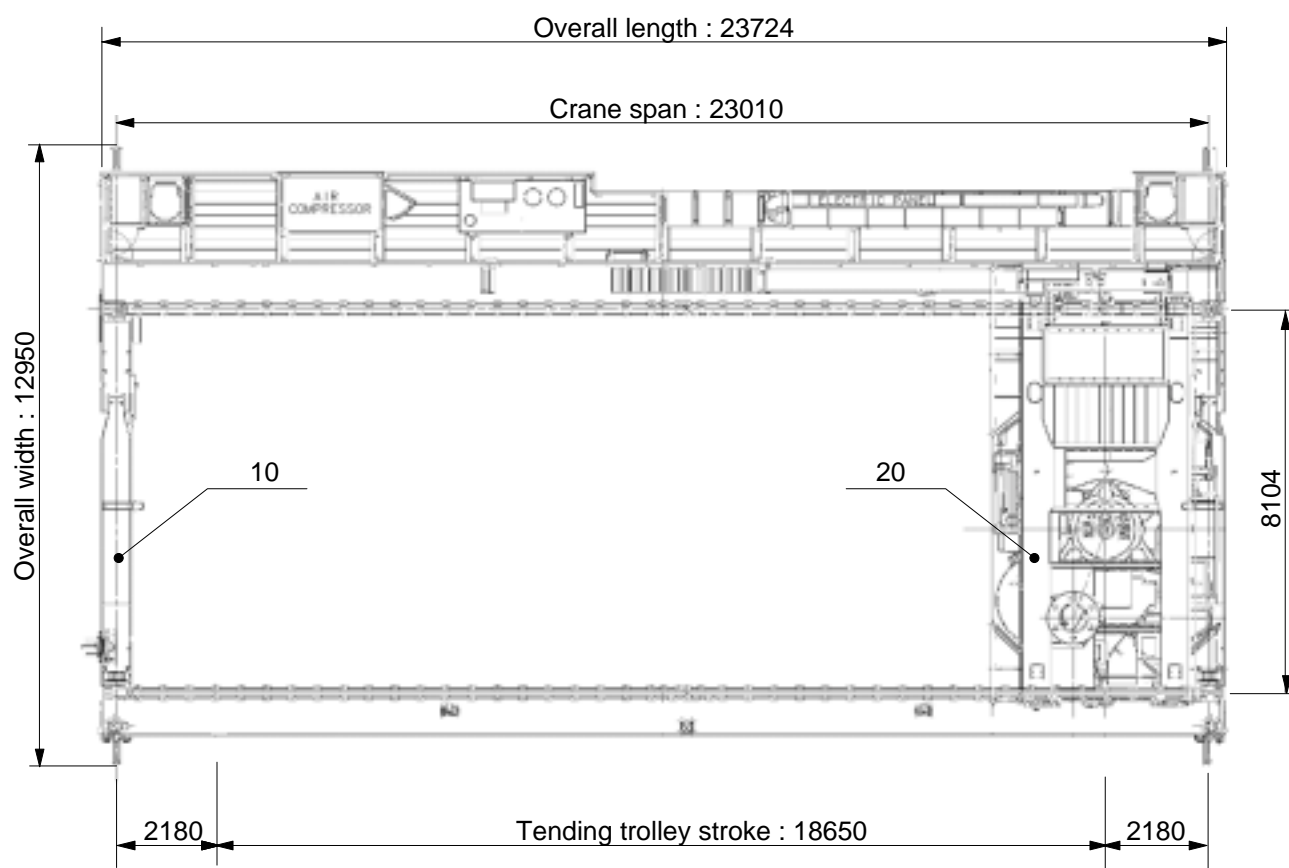
- from the control cab
- from the radio transmitter

2. DESCRIPTION OF THE POT TENDING MACHINE

The **Pot Tending Machine** is mainly composed of the following sub-assemblies :

- One long travel trolley ————— (10)
- One tending trolley ————— (20)

Figure 2 : Pot tending assembly

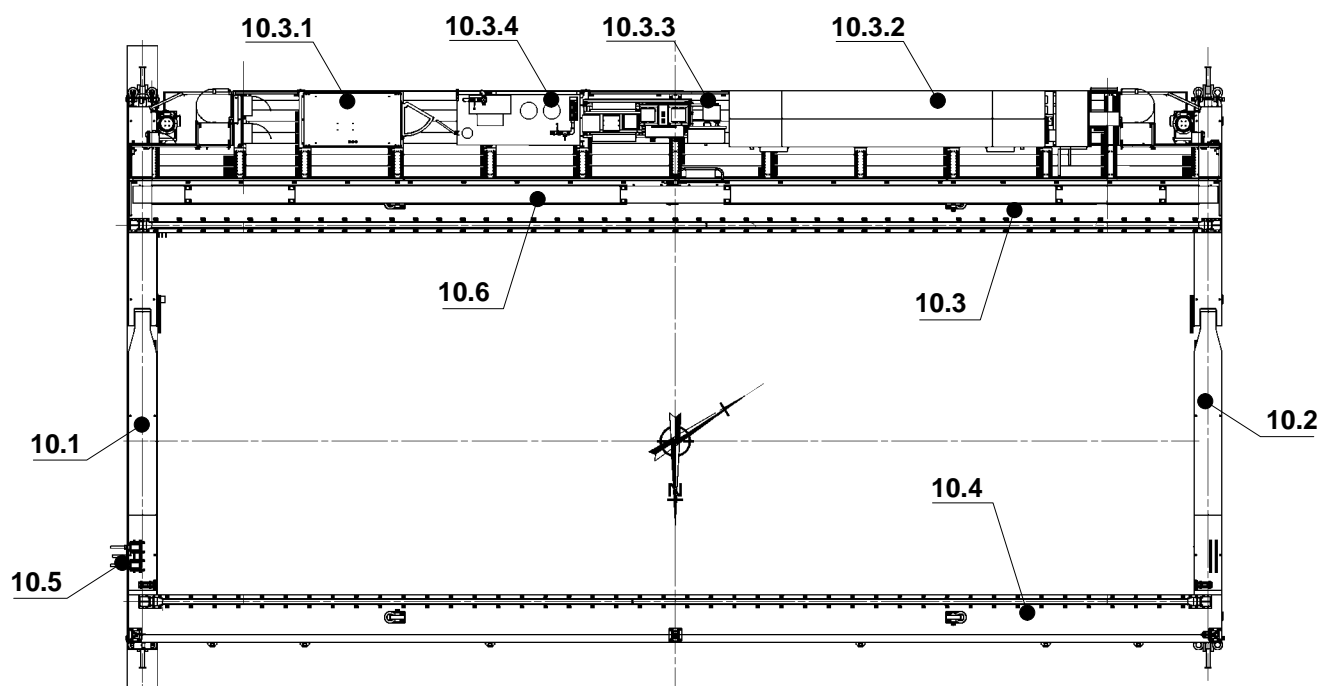


2.1. DESCRIPTION OF THE LONG TRAVEL TROLLEY (10)

The long travel trolley (10) is composed of :

- One guided end truck line — (10.1)
- One not-guided end truck line — (10.2)
- One main girder assembly — (10.3)
 - one air compressed unit — (10.3.1)
 - one electrical room — (10.3.2)
 - one cooling system — (10.3.3)
 - one air drier system — (10.3.4)
- One secondary girder assembly — (10.4)
- One power shoes bracket — (10.5)
- One feeding tending trolley chain — (10.6)

Figure 2 : Long travel trolley

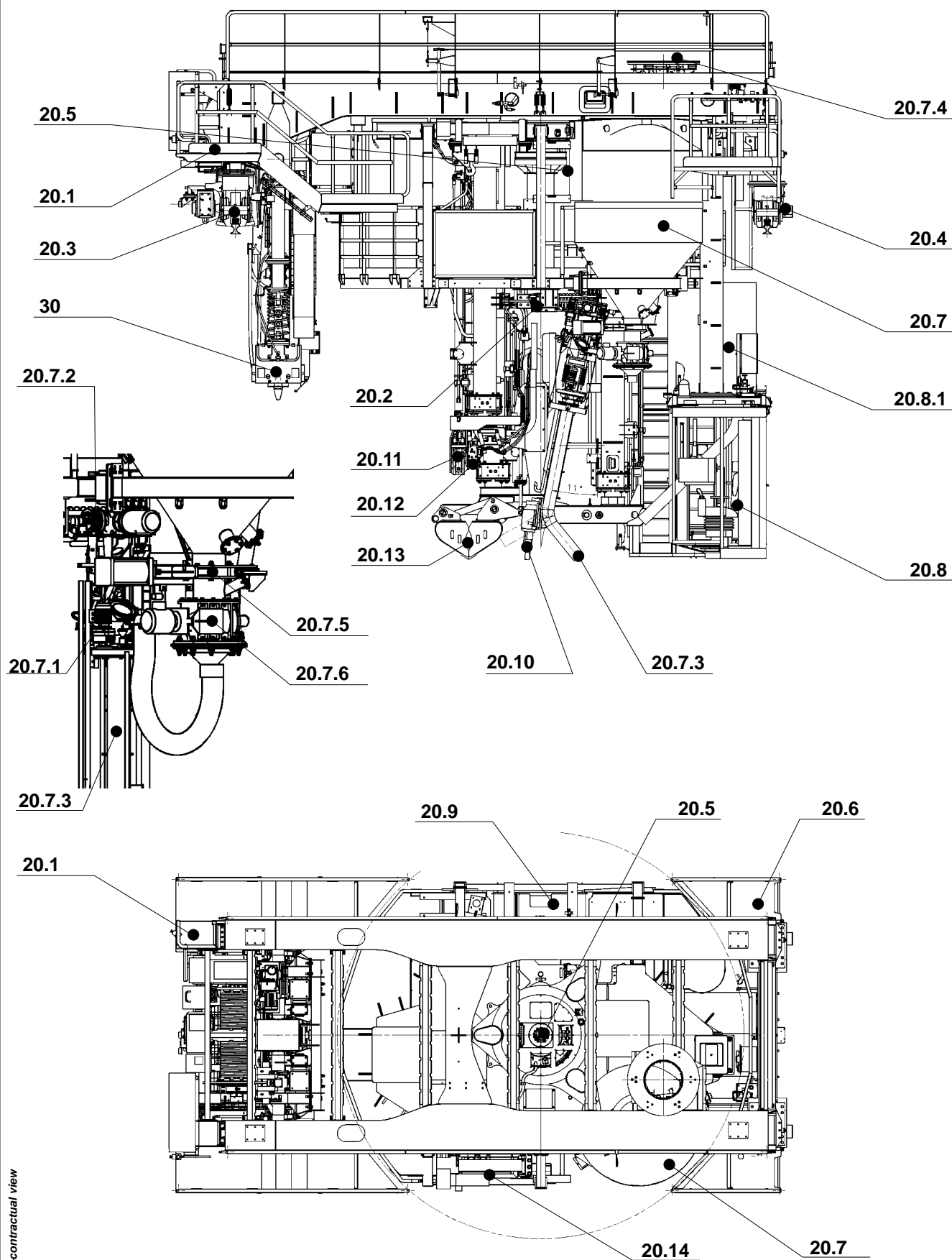


2.2. DESCRIPTION OF THE TENDING TROLLEY ASSEMBLY (20)

The tending trolley **(20)** is composed of :

- One cross travel and framework assembly — **(20.1)**
- One tools suspension assembly — **(20.2)**
- One guided end truck line — **(20.3)**
- One not guided end truck line — **(20.4)**
- One rotation mechanism — **(20.5)**
- One access platform — **(20.6)**
- One hopper assembly — **(20.7)**
 - one rotation mechanism — **(20.7.1)**
 - one lifting mechanism — **(20.7.2)**
 - one bath pipe assembly — **(20.7.3)**
 - one hopper filling devices — **(20.7.4)**
 - one closing side valve — **(20.7.5)**
 - one alumine measure device — **(20.7.6)**
- One control cab — **(20.8)**
 - one conditioning unit — **(20.8.1)**
- One hydraulic unit — **(20.9)**
- One breaking assembly — **(20.10)**
- One extracting assemblies — **(20.11)**
- One tightening assemblies — **(20.12)**
- One cleaning shovel assembly — **(20.13)**
- One 5T hoist — **(20.14)**
- One tapping tool assembly — **(30)** (*see Detail 2.3*)

Figure 3 : tending trolley assembly



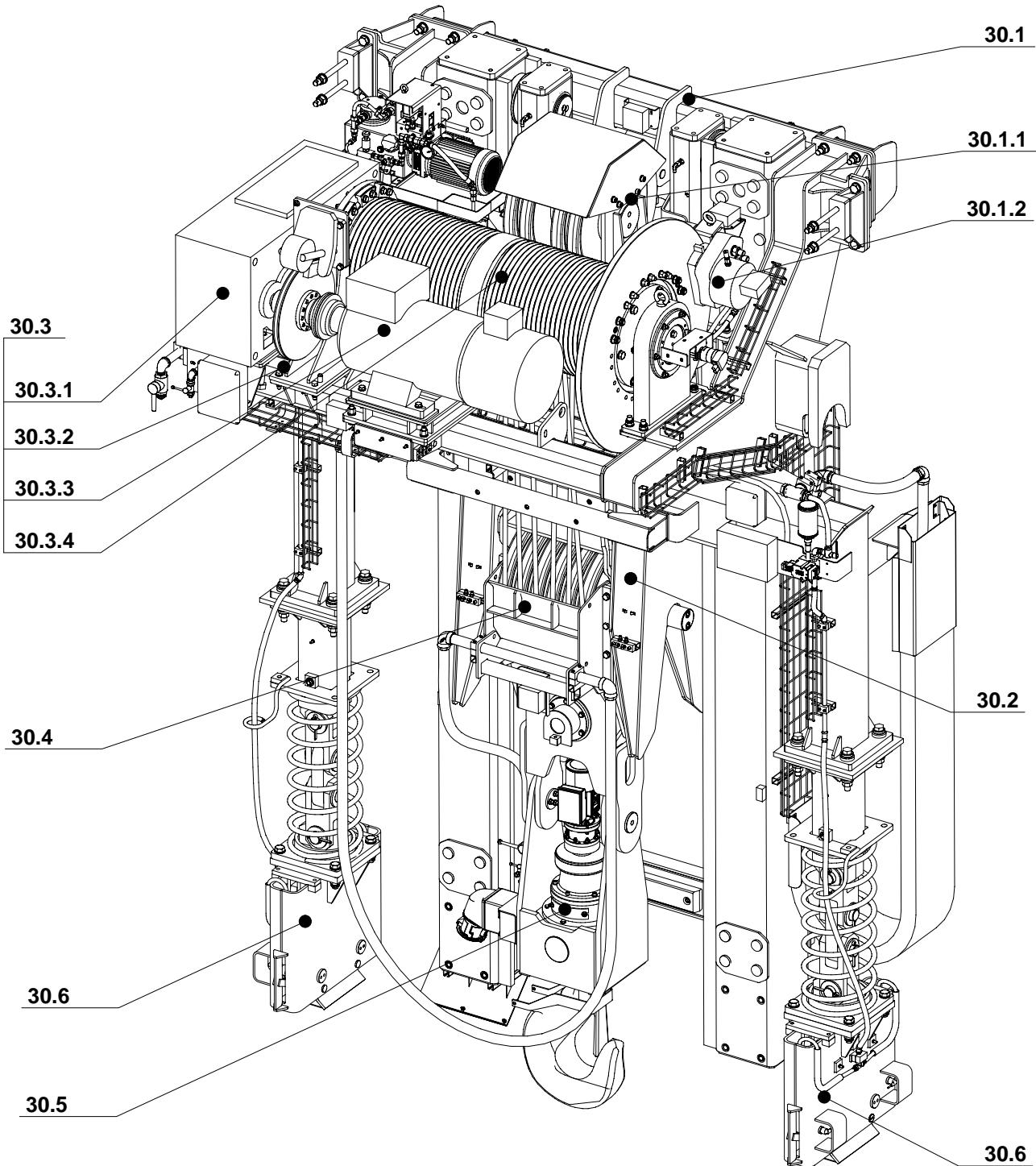
non-contractual view

2.3. DESCRIPTION OF THE TAPPING TOOL (30)

The tapping tool **(30)** is composed of :

- One fixed frame assembly ————— **(30.1)**
 - one return pulley assembly ————— **(30.1.1)**
 - one safety brake device ————— **(30.1.2)**
 - one hydraulic unit (safety brake) ————— **(30.1.3)**
- One mobile frame assembly ————— **(30.2)**
- One hoist assembly ————— **(30.3)**
 - one reducer ————— **(30.3.1)**
 - one service brake device ————— **(30.3.2)**
 - one motor ————— **(30.3.3)**
 - one drum assembly ————— **(30.3.4)**
- One pulley block ————— **(30.4)**
- One hook with rotation ————— **(30.5)**
- Two hooking clamp assembly ————— **(30.6)**

Figure 5 – Tapping tool (30)



non-contractual view

1.3 TECHNICAL DATA AND CONDITIONS OF SERVICE

1. TECHNICAL DATA

1.1. STRUCTURE

- Structure FEM Class A8
- Building rail level 5 600 mm
- Overall width of the crane 12 950 mm
- Overall length of the crane 23 724 mm
- Crane span 23 010 mm

1.2. LONG TRAVEL TROLLEY

- Mechanism FEM class M8
- Long travel speed from cabin 2 to 82 m/min (variable speed)
- Long travel speed from pendant box Max 40 m/min
- Building rail size A120
- Tending trolley rail size QU100 (main girder) & QU80 (secondary girder)
- Main wheels number 6
- Main wheels diameter 550 mm
- Guiding wheels number 4
- Guiding wheels diameter 290 mm
- Idle wheels number 4
- Idle wheels diameter 550 mm
- Bumper stroke 400 mm
- Anticollision system 1–10–914–46 & 1–10–914–47
- Weight 60 650 kg

1.2.1. AIR COMPRESSOR

- Type MS 880 L
- Nominal pressure 7 bars
- Nominal flow 14 700 l/mn at 7 bars
- Electrical power 2 x 55 kW

1.2.2. PANEL AIR CONDITIONING UNIT

- Code : 1–10–897–79

IN DESIGN BY MANUFACTURER – WAITING FOR TECHNICAL DATA

1.3. TENDING TROLLEY**1.3.1. STRUCTURE**

- FEM class A8

1.3.2. CROSS TRAVEL MECHANISM

- FEM class M7
- Speed 2 to 40 m/mn (variable speed)
- Driving wheels number 2
- Driving wheels diameter 550 mm
- Flanges idle wheels number 4
- Flanges idle wheels diameter 550 mm
- Guiding wheels number 4
- Guiding wheels diameter 290 mm

1.3.3. CAB & TOOLS ROTATION

- FEM class M7
- Rotation speed 3 rpm
- Rotation angle $\pm 220^\circ$

1.3.4. CAB AIR CONDITIONING UNIT

- Code : 1-10-898-00

IN DESIGN BY MANUFACTURER – WAITING FOR TECHNICAL DATA

1.3.5. ELECTRICAL CAB & CANDY BOX AIR CONDITIONING UNIT

- Code : 1-10-898-01

IN DESIGN BY MANUFACTURER – WAITING FOR TECHNICAL DATA

1.3.6. BREAKING MECHANISM

- Crust breaker type Pneumatic sound proof
- Theoretical power 3,8 kW
- Hammer frequency 1200 strokes/mn
- Noise level 91 dB(A) at 1.5 m
- Lifting stroke 4 015 mm
- High, up and down lifting speed From 1 to 20 m/mn

1.3.7. EXTRACTING MECHANISM

- Extraction stroke 3 000 mm
- Useful extracting capacity up to 11 000 daN
- Downward force (not including the dead weight) . 1000 daN
- Lifting speed high up 1 to 12 m/mn
- Lifting speed high down 1 to 20 m/mn
- Positioning speed 1 m/mn

1.3.8. TIGHTENING MECHANISM

- Lifting speed 12 m/mn
- Lifting stroke 1 700 mm
- Locking unlocking speed 76 rpm
- Max torque 43 mdaN
- Clamps holder capacity 75 daN

1.3.9. ANODE HOLE CLEANING SHOVEL

- Lifting speed 20 m/mn
- Lifting stroke 4 350 mm
- Bucket closing force 350 daN
- Width bucket capacity 1 320 mm
- Length bucket open 1 600 mm

1.3.10. AUXILIARY HOIST UNITS

- FEM class M5
- Lifting speed 0.8 & 5 m/mn
- Lifting stroke 8 000 mm
- Lifting capacity 5 000 daN
- Electrical power 4,8 kW

1.3.11. HOPPER

- Alumina or crushed bath capacity 5.5 m³ from high level sensor to low level sensor
- Discharge flow 17 m³ /h maxi
- Telescopic pipe stroke 3 250 mm
- Pipe lifting speed 15 m/mn
- Electrical power 1.1 kW

1.4. TAPPING TOOL**1.4.1. STRUCTURE**

- FEM class A8

1.4.2. GUIDED HOIST MECHANISM

- FEM class M6
- Useful hoisting capacity 36 000 daN
- Hoisting stroke guided 3 100 mm
- Hoisting stroke free 2 000 mm
- Hoisting stroke total 5 100 mm
- Hook maximum level 6 300 mm
- Hoisting speed 4 m/mn
- Hook rotation angle 360° endless
- Hook rotation speed 1,2 rpm

2. SITE GENERAL CONDITIONS

- Permanent ambient temperature indoor 5°C up to 60°C
- Humidity Average 80%

3. ELECTRICAL SPECIFICATIONS

Electrical specifications

- Power supply 480 VAC, 50Hz
- Control voltages / Lighting 24 VDC
- Lighting 277 VAC
- PLC Inputs / Outputs 24 VDC
- Pneumatic Solenoids 24 VDC
- Hydraulic Solenoids 24 VDC
- Plug 230 VAC

3.1. EXTRACTING MECHANISM

- Extraction stroke 3 200 mm
- Useful extracting capacity up to 11 000 daN
- Downward force (not including the dead weight) . 1000 daN
- Lifting speed high up 1 to 12 m/mn
- Lifting speed high down 1 to 20 m/mn
- Positioning speed 1 m/mn

3.1.1. TIGHTENING MECHANISM

- Lifting speed 12 m/mn
- Lifting stroke 1 700 mm
- Locking unlocking speed 76 rpm
- Max torque 43 mdaN
- Clamps holder capacity 75 daN

3.1.2. ANODE HOLE CLEANING SHOVEL

- Lifting speed 20 m/mn
- Lifting stroke 4 500 mm
- Bucket closing force **350 daN**
- Width bucket capacity 1 320 mm
- Length bucket open 1 640 mm

3.1.3. AUXILIARY HOIST UNITS

- FEM class M5
- Lifting speed 0.8 & 5 m/mn
- Lifting stroke 8 000 mm
- Lifting capacity 5 000 daN
- Electrical power 4,8 kW

3.1.4. HOPPER

- Alumina or crushed bath capacity 5.5 m³ from high level sensor to low level sensor
- Discharge flow 17 m³ /h maxi
- Telescopic pipe stroke 3 450 mm
- Pipe lifting speed 15 m/mn
- Electrical power 1.1 kW

3.2. TAPPING TOOL

3.2.1. STRUCTURE

- FEM class A8

3.2.2. GUIDED HOIST MECHANISM

- FEM class M6
- Useful hoisting capacity 35 000 daN
- Hoisting stroke guided 3 100 mm
- Hoisting stroke free 2 000 mm
- Hoisting stroke total 5 100 mm
- Hook maximum level 6 300 mm
- Hoisting speed 4 m/mn
- Hook rotation angle 360° endless
- Hook rotation speed 1,2 rpm

4. SITE GENERAL CONDITIONS

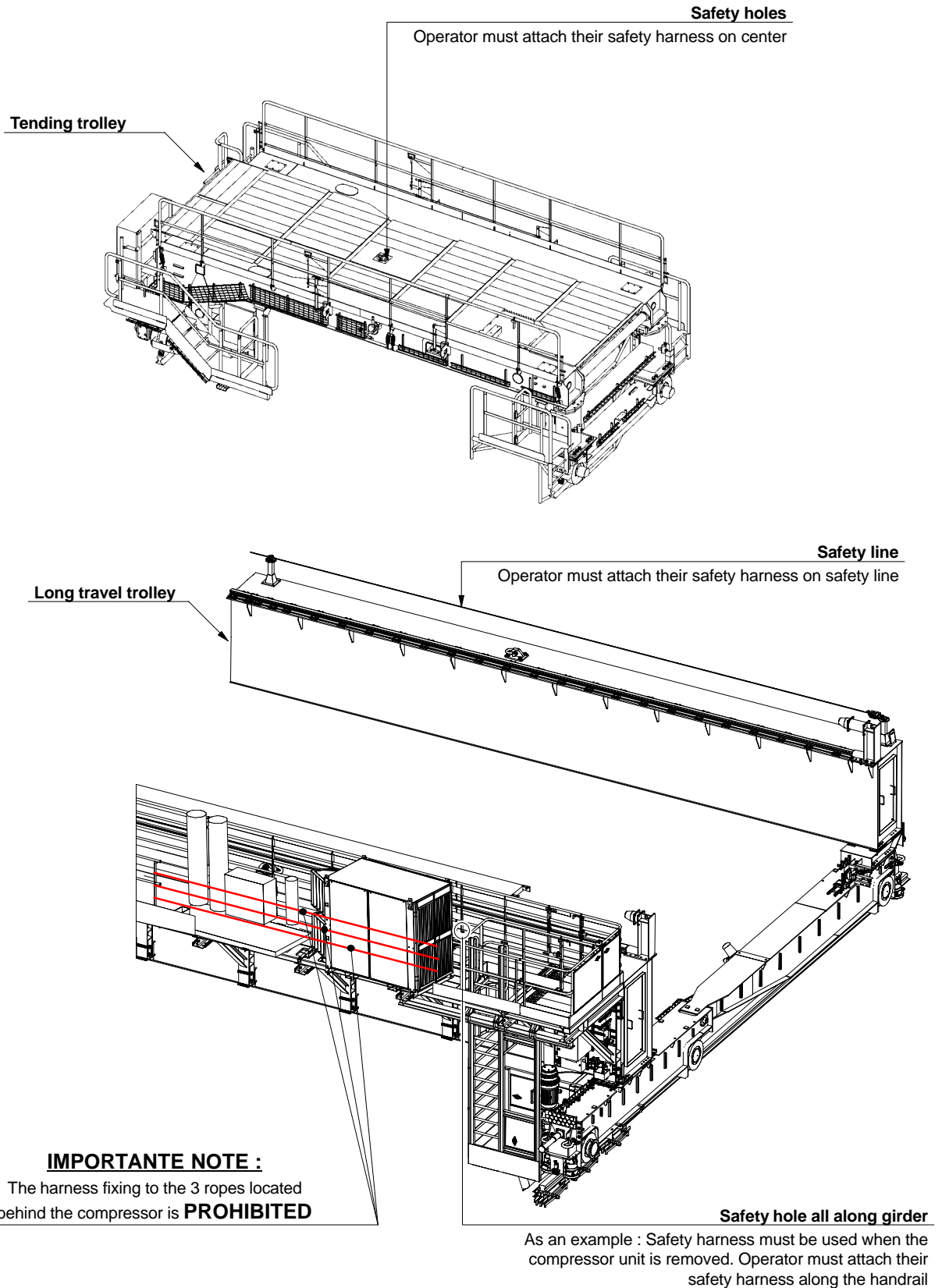
- Permanent ambient temperature indoor 5°C up to 60°C
- Humidity Average 80%

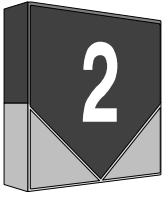
5. ELECTRICAL SPECIFICATIONS

Electrical specifications

- Power supply 380 VAC, 50Hz
- Control voltages 110 VAC
- Lighting / Utilities 220 VAC
- PLC Inputs / Outputs 24 VDC
- Pneumatic Solenoids 24 VDC
- Hydraulic Solenoids 24 VDC

1.4 MAINTENANCE ACCESS DESCRIPTION





TECHNICAL AND SAFETY DATA SHEETS

CONTENTS OF THE CHAPTER

TECHNICAL DATA SHEETS	2.1-1
SAFETY DATA SHEETS	2.2-1

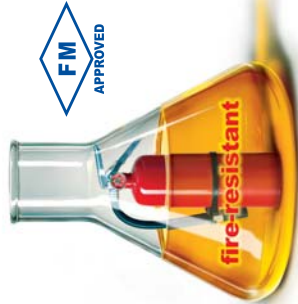


2.1 TECHNICAL DATA SHEETS

1. QUAKER CHEMICAL – QUINTOLUBRIC N888–68
2. MOBIL – MOBILGREASE XHP 322 SPECIAL
3. MOBIL – MOBILGEAR XMP 320
4. MOBIL – MOBIL SHC 630 SERIES
5. MOBIL – MOBILGEAR 600 SERIES
6. MOBIL – MOBIL 1 5W50
7. MOBIL – MOBILARMA MT
8. MOBIL – MOBILGREASE XHP 103
9. MOBIL – ALMO 527
10. FUCHS – RENISO SE 55
11. AIR LIQUIDE – FRIGORIC GAZ R227
12. LOCTITE – LUBRICOMET AS 767
13. ENERPAC – ENERPAC OIL (*)
14. TEXACO – MULTIFAK EP2

*(NA : NOT AVAILABLE)

QUINTOLUBRIC® 888-68



APPLICATIONS

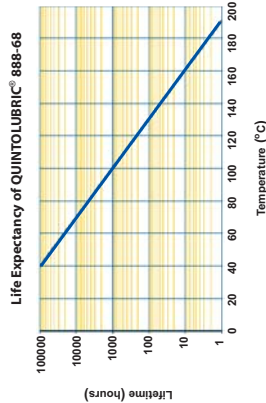
QUINTOLUBRIC® 888-68 was designed to replace anti-wear, mineral oil-based hydraulic fluids used in applications where fire hazards exist. QUINTOLUBRIC® 888-68 can also be used in environmentally sensitive hydraulic applications without compromising the overall hydraulic system operations. This fluid does not contain water, mineral oil, or phosphate ester, and is based on high-quality, synthetic, organic esters and carefully selected additives to achieve excellent hydraulic fluid performance. QUINTOLUBRIC® 888-68 offers the lubrication level of premium, anti-wear hydraulic oils, and can be used with hydraulic components from all major manufacturers.

BENEFITS

- Fire-resistant
 - High ignition temperature and low heat release
 - Properties that limit the spread of fire
 - Excellent shear stability
 - Approved by Factory Mutual Approvals
- Non-toxic / non-toxic to aquatic life
- Non-irritating
- Fully biodegradable
- Simple waste treatment

PERFORMANCE

Properly maintained QUINTOLUBRIC® 888-68 has a useful life comparable to that of mineral oil fluids. Specific fluid lifetimes depends primarily on temperature as shown in the graph.



QUINTOLUBRIC® 888-68

COMPATIBILITY

The following chart contains our recommendations regarding the use of QUINTOLUBRIC® 888-68 with commonly used elastomers. The elastomer applications listed are "Static," which refers to trapped nonmoving seals such as O-rings in valve sub-plates and rigid, low pressure hose connections; "Mild-Dynamic," whose applications include accumulator bladders and hose linings where the hoses are exposed to high pressure and light flexing; and "Dynamic," which refers to cylinder rod seals, pump shaft seals and constantly flexing hydraulic hose.

Elastomers

ISO 1629	DESCRIPTION	STATIC	MILD DYNAMIC	DYNAMIC
NBR	Medium to high nitrile rubber (Buna N, >30% acrylonitrile)	C	C	C
NBR	Low nitrile rubber (Buna N, <30% acrylonitrile)	S	N	N
FPM	Fluoroelastomer (Viton®)	C	C	C
CR	Neoprene	S	S	S
IIR	Butyl rubber	S	N	N
EPDM	Ethylene propylene rubber	N	N	N
AU	Polyurethane	C	C	C
PTFE	Teflon®	C	C	C

C = Compatible
S = Satisfactory for short term use, but replacement with a completely compatible elastomer is recommended at the earliest convenience.
N = Not Compatible

Metals

QUINTOLUBRIC® 888-68 is compatible with iron and steel alloys and most nonferrous metals and their alloys. It is not compatible with lead, cadmium, zinc, and alloys containing high levels of these metals. Suitable substitutes for these materials are available and should be used.

Paints and Coatings

QUINTOLUBRIC® 888-68 is compatible with multi-component epoxy coatings. It is not compatible with zinc-based coatings. Specific coating and application recommendations can be obtained from coating manufacturers or directly from Quaker Chemical.

Fluids

QUINTOLUBRIC® 888-46 is compatible and miscible with nearly all mineral oil and polyolester-type hydraulic fluids and with some, but not all, phosphate esters. It is not miscible or compatible with water-containing fluids. For conversion recommendations, please contact Quaker.

ENGINEERING DATA

PROPERTIES	METHOD	QUINTOLUBRIC® 888-68
Specific Heat at 20°C	ASTM D 2766	2.06 kJ/kg °C 49 Btu/lb °F
Coefficient of Thermal Expansion at 20°C	ASTM D 1903	6 X 10 ⁻⁴ per °C
Vapor Pressure At 20°C At 66°C	ASTM 02551	3.2 X 10 ⁻⁴ mmHg 7.5 X 10 ⁻⁶ mm Hg
Bulk Modulus at 20°C At 210 bar At 3,000 psi		1.87 X 10 ¹⁰ N/cm² 266,900 psi
Thermal Conductivity at 19°C	ASTM D 2717	0.167 J/sec/m²°C
Dielectric Breakdown Voltage	ASTM D 877	30 kV

*Country-specific MSDS are available.



www.quintolubric.com
www.quakerchem.com



Mobilgrease XHP

Grease

Product Description

Mobilgrease XHP Series products are extra high performance lithium complex greases intended for a wide variety of applications and severe operating conditions. These greases were designed to outperform conventional products by applying leading edge, proprietary, lithium complex manufacturing technology. They are based on high quality paraffinic mineral oils and are manufactured and formulated to provide excellent high temperature performance with superb adhesion, structural stability and resistance to water contamination. These greases have a high level of chemical stability and offer excellent protection against rust and corrosion. The greases feature high dropping points and maximum recommended operating temperature for the Series is 175°C. Mobilgrease XHP Series greases are available in NLGI grades 3, 2 and 1 and with base oil viscosities ranging from ISO VG 100 to ISO VG 460.

Mobilgrease XHP greases are designed for a wide range of applications including the industrial, automotive, construction and marine sectors. Their performance features make them ideal choices for severe operating conditions including high temperature, water contamination, high loads and shock loading and extended re-lubrication operations. Mobilgrease XHP 322 Special is an extreme pressure grease containing molybdenum disulphide that provides protection from wear under shock loads and fretting conditions.

Features & Benefits

Mobilgrease XHP greases are leading members of the Mobilgrease brand of products, which has gained a reputation world-wide for innovation and performance excellence. Mobilgrease XHP greases are state-of-the-art products designed by our formulation technologists and backed by our world-wide technical support staff.

A key factor in the excellent adhesion and cohesion properties and high drop point of Mobilgrease XHP is the proprietary manufacturing technology developed at our research facilities and adopted by our modern manufacturing facilities. These products use specially selected additives to provide excellent oxidation stability, rust & corrosion control, resistance to water contamination as well as anti-wear and EP protection. Mobilgrease XHP Series products offer the following features and potential benefits:

Features	Advantages and Potential Benefits
Superb resistance to water washout and spray-off	Assures proper lubrication and protection even in the most severe water exposure conditions
Highly adhesive and cohesive structure	Excellent grease tenacity, reduced leakage and extended re-lubrication intervals for reduced maintenance requirements.
Excellent rust and corrosion resistance	Protection of lubricated parts even in hostile aqueous environments, especially acidic water
Very good resistance to thermal, oxidative and structural degradation at high temperature	Extended grease life and enhanced bearing protection in high temperature applications offers reduced maintenance and replacement cost benefits.
Very good anti-wear and EP performance	Reliable protection of lubricated equipment, even under conditions of high sliding and shock loading with potential for extended equipment life and reduced unanticipated downtime
Broad multi-purpose application	Provides potential for inventory rationalisation and reduced inventory costs

ExxonMobil Lubricants & Specialties
This information relates only to products supplied in Europe (including Turkey) and the Former Soviet Union. All products may not be available locally. For more information, contact your local sales office or visit www.exxonmobil.com.
ExxonMobil is comprised of numerous affiliates and subsidiaries, many with names that include Esso, Mobil, or ExxonMobil. Nothing in this document is intended to override or supersede the corporate separateness of these entities. Responsibility for local action and accountability remains with the local ExxonMobil-affiliate entities. Due to continual changes in the corporate structure of ExxonMobil, the information contained herein is subject to change without notification. Typical Properties may vary slightly.
© 2001 Exxon Mobil Corporation. All rights reserved.



Applications

Mobilgrease XHP greases are used in a wide range of equipment including industrial, automotive, construction and marine applications:

- Mobilgrease XHP 103 is recommended for severe applications where good high temperature and anti-leakage properties are required. It is particularly recommended for electric motor bearings, severe truck wheel bearing applications or for rolling element bearings subject to vibration.
- Mobilgrease XHP 221 provides a heavier lubrication film thickness than Mobilgrease XHP 103 while the NLGI 1 Grade ensures better low temperature performance and pumpability.
- Mobilgrease XHP 222 is recommended for industrial and automotive antifriction bearings, chassis components, universal joints and disc brake wheel bearings. It finds particular application in passenger cars, light trucks, taxi fleets and farm equipment. It is also recommended for marine, paper mill, sugar mill and mining applications
- Mobilgrease XHP 461 is recommended for construction and mining equipment, paper and steel mills and other heavy-duty applications.
- Mobilgrease XHP 322 Special is primarily recommended in mining and construction equipment operating under heavy loads or vibrations where the molybdenum disulphide will provide additional wear protection. It is also used in highly loaded plain and antifriction industrial bearings and in heavy-duty trucks especially for hinges, king pins, fifth wheels and bucket pins.

Typical Properties

Mobilgrease XHP	103	221	222	223	322	Special	461
NLGI Grade	3	2	2	3	2	1 1/2	
Thickener Type	Li-	Complex	Li-	Complex	Complex	Li-	Complex
Color, Visual	Dark Blue	Dark Blue	Dark Blue	Dark Grey-Black	Dark Grey-Black	Dark Blue	Dark Grey-Black
Penetration, Worked, 25°C, ASTM D 217	235	325	280	235	280	305	305
Dropping Point, °C, ASTM D 2265	280	280	280	280	280	280	280
Viscosity of Oil, ASTM D 445	100	220	220	220	320	460	
Penetration Consistency Change, Roll Stability, ASTM D 1831, mm/10	10	10	- 8	10	- 3	10	
4-Ball Wear Test, ASTM D 2266, scar, mm	0.5	0.5	0.5	0.5	0.5	0.5	0.5
4-Ball Weld Load, ASTM D 2509, kg	315	315	315	315	315	315	315
Timken OK Load, ASTM D 2509, lb	45	45	45	45	45	45	45
Bomb Oxidation, ASTM D 942, Pressure drop at 100 h, kPa	35	35	35	35	35	35	35
Corrosion Prevention, ASTM D 1743	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Emcor Rust, IP 220, Acidic Water	0	0	0	0	0	0	0
Rust Protection, IP 220-mod, Distilled Water Washout	0	0	0	0	0	0	0
Copper Strip Corrosion, ASTM D 4048	1A	1A	1A	1A	1A	1A	1A
Water Spray Resistance, ASTM D 4049, % Spray-off	15	15	15	15	15	15	15
Water Washout, ASTM D 1264, wt % loss at 79°C	5	8	5	5	5	6	5

ExxonMobil Lubricants & Specialties
This information relates only to products supplied in Europe (including Turkey) and the Former Soviet Union. All products may not be available locally. For more information, contact your local sales office or visit www.exxonmobil.com.
ExxonMobil is comprised of numerous affiliates and subsidiaries, many with names that include Esso, Mobil, or ExxonMobil. Nothing in this document is intended to override or supersede the corporate separateness of these entities. Responsibility for local action and accountability remains with the local ExxonMobil-affiliate entities. Due to continual changes in the corporate structure of ExxonMobil, the information contained herein is subject to change without notification. Typical Properties may vary slightly.
© 2001 Exxon Mobil Corporation. All rights reserved.





Health & Safety

Based on available information, this product is not expected to produce adverse effects on health when used for the intended application and the recommendations provided in the Material Safety Data Sheet (MSDS) are followed. MSDS's are available upon request through your sales contract office, or via the Internet. This product should not be used for purposes other than its intended use. If disposing of used product, take care to protect the environment.

The Mobil logotype, the Pegasus design are trademarks of Exxon Mobil Corporation, or one of its subsidiaries.



ExxonMobil Lubricants & Specialties
This information relates only to products supplied in Europe (including Turkey) and the Former Soviet Union. All products may not be available locally. For more information, contact your local sales office or visit www.exxonmobil.com.
ExxonMobil is comprised of numerous affiliates and subsidiaries, many with names that include Esso, Mobil, or ExxonMobil. Nothing in this document is intended to override or supersede the corporate separateness of local entities. Responsibility for local action and accountability remains with the local ExxonMobil-affiliate entities. Due to continual product and service improvements, the information contained herein is subject to change without notification. Typical Properties may vary slightly.
© 2001 Exxon Mobil Corporation. All rights reserved.



Mobilgear XMP

Extra High Performance Industrial Gear Oils

Product Description

Mobilgear XMP Series extra high performance industrial gear oils are designed to provide optimum equipment protection and oil life even under extreme conditions. Mobilgear XMP Series are based on high quality mineral base stocks and an advanced proprietary additive system designed to provide excellent protection against conventional wear modes such as scuffing but also provides a high level of resistance against micropitting fatigue. It also offers the potential for improved lubrication of gearbox rolling element bearings. Mobilgear XMP Series products offer outstanding rust and corrosion protection versus conventional gear oils, including seawater and acidic water protection. They show no tendency to plug fine filters even when wet and excellent compatibility with ferrous and non-ferrous metals even at elevated temperatures.

Mobilgear XMP lubricants are recommended for enclosed industrial gear drives including steel-on-steel spur, helical, and bevel gears. It is especially recommended for applications that may be subject to micropitting; especially heavily loaded gearboxes with surface-hardened tooth metallurgies. It may also be used in gear applications and where corrosion may be severe.

Because of their unique mix of properties, including resistance to micropitting wear, and their performance in tough applications, Mobilgear XMP Series products enjoy a growing reputation among customers and OEMs around the world.

Features & Benefits

The Mobilgear brand of lubricants is recognised and appreciated around the world for innovation and outstanding performance. A key factor in the development of Mobilgear XMP Series was the close contacts between our scientists and application specialists with key OEMs to ensure that our product offerings will provide exceptional performance with the rapidly evolving industrial gear designs and operation.

Our work with equipment builders has helped confirm the results from our own laboratory tests showing the exceptional performance of the Mobilgear XMP Series lubricants. Not least among the benefits shown in work with OEMs is the ability to resist micropitting wear which can occur with some highly loaded, case-hardened gearing applications. This cooperative work also demonstrated the all-round balanced performance benefits for the new Mobilgear SHC XMP technology.

To address the issue of micropitting gear wear, our product formulation scientists designed a proprietary combination of additives which would resist traditional gear wear mechanisms as well as protecting against micropitting and providing other key performance features. The Mobilgear XMP Series lubricants offer the following benefits:



ExxonMobil Lubricants & Specialties
All products may not be available locally. For more information, contact your local sales office or visit www.exxonmobil.com.
ExxonMobil is comprised of numerous affiliates and subsidiaries, many with names that include Esso, Mobil, or ExxonMobil. Nothing in this document is intended to override or supersede the corporate separateness of local entities. Responsibility for local action and accountability remains with the local ExxonMobil-affiliate entities. Due to continual product research and development, the information contained herein is subject to change without notification. Typical Properties may vary slightly.
© 2001 Exxon Mobil Corporation. All rights reserved.



Features	Advantages and Potential Benefits
Superb protection from micropitting fatigue wear as well as high resistance to traditional scuffing wear	Extended gear and bearing life in enclosed gear drives operating under extreme conditions of load, speed and temperature
	Reduced unexpected downtime and less maintenance – especially critical for difficult to access gearboxes.
Very good resistance to degradation at high temperatures	Extended oil life and drain intervals reduced oil consumption and manpower costs
Excellent resistance to rust and corrosion and very good demulsibility	Smooth, trouble-free operation at high temperatures or in water-contaminated applications
	Excellent compatibility with soft metals
No filter plugging, even in presence of water	Less filter changes and reduced maintenance costs

Applications

Mobilgear XMP Series extra high performance, industrial gear oils are designed to provide optimum equipment and oil life even under extreme conditions. They are especially formulated to resist micropitting of modern, case hardened gearing and applications where extended oil life is desired. Typical applications include:

- Wind turbines
- Plastic extruder gearboxes
- Gearboxes found in the paper, steel, oil, textile, lumber and cement industries

Specifications & Approvals

Mobilgear XMP Meets or Exceeds the following industry specifications	Mobilgear XMP 100	Mobilgear XMP 150	Mobilgear XMP 220	Mobilgear XMP 320	Mobilgear XMP 460	Mobilgear XMP 680
Meets DIN 51517 Part 3 (CLP)	X	X	X	X	X	-
Meets ISO 12925-1, Type CKD	X	X	X	X	X	-
Meets AGMA 9005-D94 –EP (at appropriate viscosity grade)	-	-	X	X	X	-

Mobilgear XMP has the following builder approvals	Mobilgear XMP 100	Mobilgear XMP 150	Mobilgear XMP 220	Mobilgear XMP 320	Mobilgear XMP 460	Mobilgear XMP 680
Hansen	X	X	X	X	X	-
David Brown	X	X	X	X	X	X
Fleeder	X	X	X	X	X	X
Jahnel-Kestermann	X	X	X	X	X	X



ExxonMobil Lubricants & Specialties
All products may not be available locally. For more information, contact your local sales office or visit www.exxonmobil.com.
ExxonMobil is comprised of numerous affiliates and subsidiaries, many with names that include Esso, Mobil, or ExxonMobil. Nothing in this document is intended to override or supersede the corporate separateness of local entities. Responsibility for local action and accountability remains with the local ExxonMobil-affiliate entities. Due to continual product research and development, the information contained herein is subject to change without notification. Typical Properties may vary slightly.
© 2001 Exxon Mobil Corporation. All rights reserved.



Typical Properties

	Mobilgear XMP 100		Mobilgear XMP 150		Mobilgear XMP 220		Mobilgear XMP 320		Mobilgear XMP 460		Mobilgear XMP 680	
ISO Viscosity Grade	100		150		220		320		460		680	
Viscosity, ASTM D 445												
cSt @ 40°C	100		150		220		320		460		680	
cSt @ 100°C	11.1		14.6		18.8		24.1		30.6		36.9	
Viscosity Index, ASTM D 2270												
Pour Point, °C, ASTM D 97	96		96		96		96		96		89	
Flash Point, °C, ASTM D 92	-30		-27		-24		-18		-12		-9	
Density @ 15.6°C, ASTM D 4052, kg/l	250		250		272		268		270		272	
FZG Micropitting, FVA Proc No. 54:	0.890		0.896		0.900		0.903		0.909		0.917	
Fail Stage	--		--		10+		10+		10+		10+	
GFT-Class	--		--		High		High		High		High	
FZG Scuffing, DIN 51534 (mod):												
A/16.6/90, Fail Stage	12		12		13+		14		14+		14+	
A/8.3/90, Fail Stage	12+		12+		13+		14		14+		14+	
4-Ball EP test, ASTM D 2783:												
Weld Load, kg	250		250		250		250		250		250	
Load Wear Index, kgf	45		45		45		45		45		45	
Rust Protection, ASTM D 665, Sea Water												
Copper Strip Corrosion, ASTM D 130, 3 hrs @ 100°C	Pass		Pass		Pass		Pass		Pass		Pass	
Water Separability, ASTM D 1401, Time to 40/37/3 at 82°C, minutes	1B		1B		1B		1B		1B		1B	
Foam Test, ASTM D 892, Seq I Tendency/Stability, ml/ml	10		10		10		10		10		10	
	0/0		0/0		0/0		0/0		0/0		0/0	

Health & Safety

Based on available information, this product is not expected to produce adverse effects on health when used for the intended application and the recommendations provided in the Material Safety Data Sheet (MSDS) are followed. MSDS's are available upon request through your sales contract office, or via the Internet. This product should not be used for purposes other than its intended use. If disposing of used product, take care to protect the environment.

The Mobil logotype, the Pegasus design and Delvac are trademarks of ExxonMobil Corporation, or one of its subsidiaries.



ExxonMobil Lubricants & Specialties
All products may not be available locally. For more information, contact your local sales office or visit www.exxonmobil.com.
ExxonMobil is comprised of numerous affiliates and subsidiaries, many with names that include Esso, Mobil, or ExxonMobil. Nothing in this document is intended to override or supersede the corporate separateness of local entities. Responsibility for local action and accountability remains with the local ExxonMobil-affiliate entities. Due to continual product research and development, the information contained herein is subject to change without notification. Typical Properties may vary slightly.
© 2001 Exxon Mobil Corporation. All rights reserved.



Mobil SHC 600* Series

Supreme Performance Gear and Bearing Oils

Product Description

Mobil SHC 600* Series (pronounced "Mobil SHC 600 Star") lubricants are supreme performance gear and bearing oils, recommended for use as a substitute in applications calling for Mobil SHC 600 Series lubricants, and designed to provide outstanding service in terms of equipment protection, oil life and problem-free operation enabling increased customer productivity. These scientifically engineered oils are formulated with synthetic base fluids with an inherently high viscosity index and a unique, proprietary, additive system which enables these products to provide outstanding performance in extreme service applications at high and low temperatures, well beyond the capabilities of mineral oils. These products are resistant to mechanical shear, even in heavily loaded gear and high shear bearing applications.

The base oils used in the Mobil SHC 600* Series have outstanding response to antioxidant additives resulting in superior resistance to oxidation and sludging, especially at high temperatures. The additive combination used in these oils also provides outstanding resistance to rusting and corrosion, excellent wear protection, demulsibility, foam control and air release properties, as well as multimetall compatibility. The Mobil SHC 600* Series oils are also compatible with the same seal and other construction materials used in equipment normally lubricated with mineral oils.

The leading edge technology on which Mobil SHC 600* Series lubricants are based makes these the products of choice for operators of a wide range of equipment. These products can be used in many industrial applications where Mobil SHC 600 series products have been used with great success. They are particularly useful as high temperature problem solvers, and offer a range of other benefits as well.

Features and Benefits

The Mobil SHC brand of lubricants are recognized and appreciated around the world for their innovation and outstanding performance. These scientifically engineered synthetic lubricants, pioneered by our research scientists, symbolize the continuing commitment to using advanced technology to provide outstanding lubricant products.

Extensive laboratory testing supports the outstanding performance of Mobil SHC 600* Series lubricants. Not least among the benefits, is the potential for efficiency improvements relative to mineral oils. These benefits will be particularly evident in equipment which, by design, cannot avoid low overall efficiency, such as high ratio worm gears.

To resist degradation of the lubricant during high thermal exposure of the oil, our product formulation scientists tested the base oils for Mobil SHC 600* Series oils for thermal/oxidative resistance. Our formulators chose specific additives to improve upon the inherent benefits of the base oils to provide excellent oil life and deposit control and resistance to thermal/oxidative and chemical degradation. This formulation approach provides low temperature fluidity characteristics unmatched by mineral products and is a key benefit for remote, low ambient temperature applications. The Mobil SHC 600* Series oils offer the following features and potential benefits:



Features	Advantages and Potential Benefits
Superb high temperature thermal/oxidation resistance	Extends equipment high temperature operating capability
	Long oil life, reduced need and costs for oil change outs
	Minimizes sludge and deposits for trouble-free operation and long filter life
High Viscosity Index	Maintains viscosity and film thickness at high temperatures
	Outstanding low temperature performance, including start-up
High load carrying capability	Protects equipment and extends life; minimizes unexpected downtime and extends service periods
Balanced additive combination	Provides excellent performance in terms of rust and corrosion prevention, water separability, foam control, air release performance ensuring problem-free operation in a wide range of industrial applications and reduced operating costs

Applications

Mobil SHC 600* Series are compatible with Mobil SHC 600 Series lubricants. Lubrications systems containing Mobil SHC 600 may be topped off or drained and filled with Mobil SHC 600*, consistent with standard oil change practices. Oil analysis parameters used with Mobil SHC 600 Series lubricants may be applied to Mobil SHC 600* Series lubricants as well. Elastomers, sealants, and paints that are compatible with Mobil SHC 600 will be compatible with Mobil SHC 600*.

Mobil SHC 600* Series lubricants are recommended as a substitute for Mobil SHC 600 Series lubricants in a variety of gear and bearing applications where high or low temperatures are encountered or where operating temperatures or bulk oil temperatures are such that conventional lubricants give unsatisfactory life, or where improved efficiency is needed. They are particularly effective in applications where the maintenance costs of component replacement, system cleaning and lubricant changes are high. Specific applications include:

- Filled for life gearboxes, especially high ratio / low-efficiency worm gears
- Remotely located gearboxes, where oil change-out is difficult
- Low temperature applications, such as ski lifts where seasonal oil changes can be avoided
- Mixer roll bearings and roll neck bearings where high temperatures are encountered
- Plastic calendars
- Railroad A/C Traction Drives

Mobil SHC 625*, 627*, 629* and 630* are suitable for Oil Flooded Rotary Screw Compressors compressing natural gas, field gas gathering, CO2 and other process gasses used in the natural gas industry

Typical Properties

Mobil SHC 600* Series	624*	625* (1)	626*	627*	629*	630*	632*	634*	636*	639*
ISO Viscosity Grade	32	46	68	100	150	220	320	460	680	1000
Viscosity, ASTM D 445										



Mobil SHC 600* Series	624*	625* (1)	626*	627*	629*	630*	632*	634*	636*	639*
cSt @ 40° C	32	46	68	100	150	220	320	460	680	1000
cSt @ 100° C	5.88	7.48	9.9	14.1	19.0	25.7	33.1	43.4	61.0	77.4
Viscosity Index, ASTM D 2270	129	127	128	144	143	148	145	147	157	153
Pour Point, °C, ASTM D 97	-48	-48	-45	-42	-42	-42	-39	-39	-39	-36
Flash Point, °C, ASTM D 92	250	250	250	250	235	235	229	238	240	218
Specific Gravity, ASTM D 4052, 15° C/15° C	0.85	0.85	0.86	0.86	0.86	0.87	0.87	0.87	0.87	0.87
Appearance, visual	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange
Rust protection, ASTM D665, Sea Water	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Water Separability, ASTM D 1401, Min. to 37 ml water @ 54° C	15	10	10	--	--	--	--	--	--	--
Water Separability, ASTM D 1401, Min. to 37 ml water @ 82° C	-	-	-	5	10	10	10	15	20	25
Copper Corrosion, ASTM D130, 24 hrs @ 121° C	1B	1B	1B	1B	1B	1B	1B	1B	1B	1B
Foam Test, ASTM D 892, Seq I, II, III Tendency / Stability, ml/ml	0/0, 20/0, 30/0	10/0, 10/0, 10/0	10/0, 20/0, 10/0	0/0, 0/0, 0/0	0/0, 0/0, 0/0	0/0, 0/0, 0/0	0/0, 0/0, 0/0	0/0, 0/0, 0/0	0/0, 0/0, 0/0	0/0, 0/0, 0/0
FZG scuffing test, DIN 51354 (mod), A/8.3/90, Failure Stage	10	11	11	13	13	13+	13+	13+	13+	13+
(1) 625 is available only in the USA										

Health and Safety

Based on available information, this product is not expected to produce adverse effects on health when used for the intended application and the recommendations provided in the Material Safety Data Sheet (MSDS) are followed. MSDS's are available upon request through your sales contract office, or via the Internet. This product should not be used for purposes other than its intended use. If disposing of used product, take care to protect the environment.

The Mobil logotype, the Pegasus design and SHC are trademarks of ExxonMobil Corporation, or one of its subsidiaries.

ExxonMobil Lubricants & Specialties
All products may not be available locally. For more information, contact your local sales office or visit www.exxonmobil.com.
This document is intended to provide a general overview of the product and its properties. It is not intended to be used as a substitute for the product's technical specifications or for the product's safety data sheet. The information contained herein is subject to change without notification. Typical Properties may vary slightly.
© 2007 Exxon Mobil Corporation. All rights reserved.



Mobilgear 600 Series

Gear Oil

Product Description

The Mobilgear 600 Series are extra high performance gear oils having outstanding extreme pressure characteristics and load-carrying properties, intended for use in all types of enclosed gear drives with circulation or splash lubrication systems. They are formulated from highly refined base stocks and a special additive system that provides an extremely high level of resistance to oxidation and chemical degradation. They have friction-modifying characteristics that reduce power consumption and lower bulk oil temperatures. The Mobilgear 600 Series oils protect against corrosion and rusting, including seawater. They have excellent water separating properties and they are strongly resistant to foaming in service.

Mobilgear 600 Series oils are recommended for industrial spur, helical and bevel enclosed gears with circulation or splash lubrication, operating at bulk oil temperatures up to 100°C. For steel-on-steel applications, Mobilgear 600 Series are recommended whereas for bronze-on-steel worm gear applications, Mobil Glygoyle HE Series or Mobil SHC 600 Series products are recommended. They are particularly suitable for gear sets working under heavy or shock loads. Minimum bulk oil temperatures are governed by the pour point of the oil. Suitable heating may be necessary for the heavier grades at ambient temperatures. Mobilgear 600 oils also find broad application in marine gearing applications. Non gear applications include plain and rolling contact bearings – especially highly loaded and slow speed.

Mobilgear 600 Series gear oils are used in a very wide variety of applications in virtually all industrial sectors as well as in marine units. They are the product of choice for many users, worldwide, based on their outstanding performance, equipment protection and application versatility.

Features & Benefits

Mobilgear 600 Series products are a leading member of the Mobil brand of industrial lubricants that enjoy a reputation for innovation and high performance capability. These mineral-based products were designed by our formulation scientists to provide high quality industrial gear oils, meeting industry standards and with high versatility to lubricate a broad range of industrial and marine equipment. Mobilgear 600 Series products offer the following features and potential benefits:

Features	Advantages and Potential Benefits
Reduced gear tooth wear due to excellent load-carrying properties	Lower operating costs, higher productivity and longer machine life because of outstanding antiwear characteristics
Outstanding resistance to oil oxidation and degradation	Extended lubricant life with lower lubricant and lubrication costs and reduced scheduled downtime
	Cleaner systems and reduced maintenance because of minimal sludge and deposit formation
Wide range of applications	Fewer grades of lubricant required because of wide range of application, leading to lower purchase and storage costs and less danger of using wrong lubricant



ExxonMobil Lubricants & Specialties
For more information, contact your local sales office or visit www.exxonmobil.com.
ExxonMobil is comprised of numerous affiliates and subsidiaries, many with names that include Esso, Mobil, or ExxonMobil. Nothing in this document is intended to override or supersede the corporate separateness of local entities. Responsibility for local action and accountability remains with the local ExxonMobil-affiliate entities. Due to continual product research and development, the information contained herein is subject to change without notification. Typical Properties may vary slightly.
© 2001 Exxon Mobil Corporation. All rights reserved.



Features	Advantages and Potential Benefits
Superior resistance to rust and corrosion of copper and soft metal alloys	Excellent protection of machine parts, with reduced maintenance and repair costs
Marked resistance to foaming and emulsion formation	Effective lubrication and problem free operation in the presence of water contamination or in equipment prone to oil foaming

Applications

Mobilgear 600 lubricants are used in a wide range of industrial and marine applications, especially spur, helical, bevel and worm gearing. Specific applications include:

Industrial gearing for conveyers, agitators, dryers, extruders, fans, mixers, presses, pulpers, pumps (including oil well pumps), screens, extruders and other heavy duty applications
Marine gearing including main propulsion, centrifuges, deck machinery such as winches, windlasses, cranes, turning gears, pumps, elevators and rudder carriers
Non-gear applications include shaft couplings, screws and heavily loaded plain and rolling contact bearings operating at slow speeds.

Specifications & Approvals

Mobilgear 600 Series meets or exceeds the following industry specifications	626	627	629	630	632	634	636
Meets AGMA 9005-D94 EP (at appropriate viscosity grade)	X	X	X	X	X	X	X
Meets DIN 51517 Part 3 (CLP)	X	X	X	X	X	X	X
Meets ISO 12925-1 Type CKC	X	X	X	X	X	X	X
Meets US Steel # 224	X	X	X	X	X	X	X

Typical Properties

Mobilgear 600 Series	626	627	629	630	632	634	636
ISO Viscosity Grade	68	100	150	220	320	460	680
Viscosity, ASTM D 445							
cSt @ 40° C	68	100	150	220	320	460	680
cSt @ 100° C	9.2	12.0	15.8	19.5	24.5	29.9	39.2
Viscosity Index, ASTM D 2270	98	98	98	98	97	96	90
Pour Point, °C, ASTM D 97	-27	-27	-27	-24	-18	-12	-9
Flash Point, °C, ASTM D 92	225	235	245	255	265	275	285
Density @15.6° C, ASTM D 4052, kg/l	0.89	0.89	0.89	0.89	0.89	0.89	0.91
Timken OK Load, ASTM D 2782, lb	65	65	65	65	65	65	65
4-Ball EP test, ASTM D 2783,							



ExxonMobil Lubricants & Specialties
For more information, contact your local sales office or visit www.exxonmobil.com.
ExxonMobil is comprised of numerous affiliates and subsidiaries, many with names that include Esso, Mobil, or ExxonMobil. Nothing in this document is intended to override or supersede the corporate separateness of local entities. Responsibility for local action and accountability remains with the local ExxonMobil-affiliate entities. Due to continual product research and development, the information contained herein is subject to change without notification. Typical Properties may vary slightly.
© 2001 Exxon Mobil Corporation. All rights reserved.



Mobilgear 600 Series	626	627	629	630	632	634	636
Weld Load, kg	250	250	250	250	250	250	250
Load Wear Index, kgf	48	48	48	48	48	48	48
FZG Scuffing, DIN 51534, A/B 3/90, Fail Stage	12+	12+	12+	12+	12+	12+	12+
Rust protection, ASTM D 665, Sea Water	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Copper Strip Corrosion, ASTM D 130, 3 hrs @ 100° C	1B	1B	1B	1B	1B	1B	1B
Demulsibility, ASTM D 1401, @ 54° C	30						
Time to 3ml emulsion, minutes @ 82° C		30	30	30	30	30	30
Foam Test, ASTM D 892, Seq I & II, Tendency/Stability, ml/ml	0/0	0/0	0/0	0/0	0/0	0/0	0/0

Health & Safety

Based on available information, this product is not expected to produce adverse effects on health when used for the intended application and the recommendations provided in the Material Safety Data Sheet (MSDS) are followed. MSDS's are available upon request through your sales contract office, or via the Internet. This product should not be used for purposes other than its intended use. If disposing of used product, take care to protect the environment.

The Mobil logotype, the Pegasus design and Delvac are trademarks of ExxonMobil Corporation, or one of its subsidiaries.



ExxonMobil Lubricants & Specialties
ExxonMobil is a registered service mark of ExxonMobil Company. For more information, contact your local sales office or visit www.exxonmobil.com.
ExxonMobil is comprised of numerous affiliates and subsidiaries, many with names that include Esso, Mobil, or ExxonMobil. Nothing in this document is intended to override or supersede the corporate separateness of local entities. Responsibility for local action and accountability remains with the local ExxonMobil affiliate entities. Due to continual product research and development, the information contained herein is subject to change without notification. Typical Properties may vary slightly.
© 2001 Exxon Mobil Corporation. All rights reserved.



Mobil 1 5W-50

Most Advanced Performance, Full Synthetic Four-Stroke Engine Oil

Product Description

Mobil 1 5W-50 is the most advanced performance synthetic engine oil designed to provide ultimate wear protection for a smooth driving experience every time. Mobil 1 5W-50, *Rally Formula*, exceeds the requirements of the industry and car manufacturers' standards required for high-performance turbo-charged, supercharged gasoline and diesel multi-valve fuel injected engines. Mobil 1 5W-50 is especially suited for high speed and severe service associated with stop and go driving. Racing or normal driving, Mobil 1 5W-50, *Rally Formula*, provides heavy-duty engine performance and protection for an outstanding driving experience.

Features & Benefits

Mobil 1 5W-50 is made with a patented proprietary blend of ultra high performance synthetic basestocks fortified with Supersyn Antiwear Technology, the most advanced additive system available today. Mobil 1 5W-50's wide viscosity grade together with patented Supersyn Antiwear Technology provides a flexible combination of powerful protection agents to outperform in many driving situations. This oil, not only exceeds the toughest industry performance standards, it is approved by several major car manufacturers for service fill use. Cars using Mobil 1 5W-50 will perform flawlessly, no matter what the driving conditions, situation or age. Key features and benefits include:

Features	Advantages and Potential Benefits
Active cleaning agents	Actively prevents deposits and sludge build-up to enable long and clean engine life
Outstanding thermal and oxidation stability	Reduces oil aging allowing extended drain interval protection
Lowest oil consumption	Less hydrocarbon pollution and oil make up due to evaporation
Race Proven Technology	Performance reserve in the most extreme driving situations
High Viscosity Index and Supersyn Antiwear Technology	Excellent overall lubrication and wear protection performance for all driving styles and conditions

Applications

Mobil 1 5W-50 is recommended for all types of vehicles, suitable for use in high-performance turbo-charged, supercharged gasoline and diesel multi-valve fuel injected engines found in passenger cars, light vans and trucks.

- Mobil 1 5W-50 is suitable for all types of severe driving applications, especially demanding conditions including high speed highway and stop and go city driving.
- Mobil 1 is not recommended for 2-Cycle or aviation engines, unless specifically approved by the manufacturer



ExxonMobil Lubricants & Specialties
All products may not be available locally. For more information, contact your local sales office or visit www.exxonmobil.com.
ExxonMobil is comprised of numerous affiliates and subsidiaries, many with names that include Esso, Mobil, or ExxonMobil. Nothing in this document is intended to override or supersede the corporate separateness of local entities. Responsibility for local action and accountability remains with the local ExxonMobil-affiliate entities. Due to continual product research and development, the information contained herein is subject to change without notification. Typical Properties may vary slightly.
© 2001 Exxon Mobil Corporation. All rights reserved.



Specifications & Approvals

Mobil 1 5W-50 meets or exceeds the following industry specifications:

ACEA	A3,B3,B4
API	SL,SJ,CF

Mobil 1 5W-50 has the following builder approvals:

Daimler Chrysler	229.3
Porsche	Approved
Volkswagen	505.00

Typical Properties

Mobil 1 5W-50	
SAE Grade	5W-50
Viscosity, ASTM D 445	
cSt @ 40° C	104.9
cSt @ 100° C	17.5
Viscosity Index, ASTM D 2270	184
Sulfated Ash, wt%, ASTM D 874	1.2
HTHS Viscosity, mPa.s @ 150° C ASTM D 4683	4.21
Pour Point, °C, ASTM D 97	-54
Flash Point, °C, ASTM D 92	236
Density @15 °C kg/L, ASTM D 4052	0.859

Health & Safety

Based on available information, this product is not expected to produce adverse effects on health when used for the intended application and the recommendations provided in the Material Safety Data Sheet (MSDS) are followed. MSDS's are available upon request through your sales contract office, or via the Internet. This product should not be used for purposes other than its intended use. If disposing of used product, take care to protect the environment.

The Mobil logo type, the Pegasus design and Mobil 1 with Supersyn are trademarks of Exxon Mobil Corporation, or one of its subsidiaries.



ExxonMobil Lubricants & Specialties
All products may not be available locally. For more information, contact your local sales office or visit www.exxonmobil.com.
ExxonMobil is comprised of numerous affiliates and subsidiaries, many with names that include Esso, Mobil, or ExxonMobil. Nothing in this document is intended to override or supersede the corporate separateness of local entities. Responsibility for local action and accountability remains with the local ExxonMobil-affiliate entities. Due to continual product research and development, the information contained herein is subject to change without notification. Typical Properties may vary slightly.
© 2001 Exxon Mobil Corporation. All rights reserved.



Mobilarma Double Letter Series

Rust Preventive

Product Description

Mobilarma Double Letter Series are a range of solvent based high performance rust preventives. They are based on a carefully selected high flash point solvents and modern, technically advanced corrosion inhibitors. Mobilarma Double Letter Series combine excellent corrosion protection and environmental awareness for a wide variety of applications, components and conditions. The high flash point solvent has the affect of increasing coverage capacity meaning lower oil consumption. Mobilarma Double Letter Series are free from added barium.

Features & Benefits

Features	Advantages and Potential Benefits
High flash point narrow cut solvents	Lower evaporation means lower oil consumption and improved operator acceptability
Effective dewatering and corrosion protection	Removes all traces of moisture from components to lead to long-term rust and corrosion protection
Improved coverage capacity	Enhanced product utilisation and lower product consumption
Multi purpose in application	Reduced inventory required. Can be used on a variety of different feed stocks using a range of application methods
Thin, transparent robust films	Makes it easier to read markings on components

Applications

Mobilarma ST is for short term corrosion protection of ferrous and alloy components during indoor storage and transit. It can also be used to give inter operational protection following machining, pickling, phosphating and electro-chemical processes. It will rapidly displace water and leave a thin oily protective film.

Mobilarma MT is for a multi purpose rust preventative providing medium term protection of ferrous and alloy components during storage and transit. It is particularly suitable for the protection of highly machined precision parts where heavy films are not desirable.

Mobilarma LT is for general purpose rust preventative providing medium to long term protection of ferrous and alloy components. It is especially suited for the protection, during storage, of many types of spares e.g. engine components, automotive parts as well as extruded and machined surfaces. The protective film is very effective against acidic and other aggressive atmospheres.

Mobilarma Double Letter Series are best applied by dipping but they can be flooded, sprayed or brushed on. Where necessary they can be removed by hydrocarbon solvents or suitable alkaline cleaners.



ExxonMobil Lubricants & Specialties
For more information, contact your local sales office or visit www.exxonmobil.com.
ExxonMobil is comprised of numerous affiliates and subsidiaries, many with names that include Esso, Mobil, or ExxonMobil. Nothing in this document is intended to override or supersede the corporate separateness of local entities. Responsibility for local action and accountability remains with the local ExxonMobil-affiliate entities. Due to continual product research and development, the information contained herein is subject to change without notification. Typical Properties may vary slightly.
© 2001 Exxon Mobil Corporation. All rights reserved.



Typical Properties

Test Method	Test	Units	Mobilarma ST	Mobilarma MT	Mobilarma LT
Appearance	Visual				
Film Type	Visual		Very thin oil	Light grease	Waxy-grease
Density	ASTM D1298	kg/l	0.810	0.810	0.820
Drying Time at 20°C		mins	90	90	240
Coverage Capacity		m ² /litre	140	120	38
Flash Point	ASTM D93	°C	62	62	62
Film Thickness		microns	0.8	1.5	8.0
Corrosion Protection, indoor			3 months	9 months	24 months
Corrosion Protection, outdoor			Not recommended	3 months	12 months

Health & Safety

Based on available information, this product is not expected to produce adverse effects on health when used for the intended application and the recommendations provided in the Material Safety Data Sheet (MSDS) are followed. MSDS's are available upon request through your sales contact office, or via the Internet. This product should not be used for purposes other than its intended use. If disposing of used product, take care to protect the environment.

The Mobil logo type, the Pegasus design are trademarks of Exxon Mobil Corporation, or one of its subsidiaries.



Mobilgrease XHP

Grease

Product Description

Mobilgrease XHP Series products are extra high performance lithium complex greases intended for a wide variety of applications and severe operating conditions. These greases were designed to outperform conventional products by applying leading edge, proprietary, lithium complex manufacturing technology. They are based on high quality paraffinic mineral oils and are manufactured and formulated to provide excellent high temperature performance with superb adhesion, structural stability and resistance to water contamination. These greases have a high level of chemical stability and offer excellent protection against rust and corrosion. The greases feature high dropping points and maximum recommended operating temperature for the Series is 175°C. Mobilgrease XHP Series greases are available in NLGI grades 3, 2 and 1 and with base oil viscosities ranging from ISO VG 100 to ISO VG 460.

Mobilgrease XHP greases are designed for a wide range of applications including the industrial, automotive, construction and marine sectors. Their performance features make them ideal choices for severe operating conditions including high temperature, water contamination, high loads and shock loading and extended re-lubrication operations. Mobilgrease XHP 322 Special is an extreme pressure grease containing molybdenum disulphide that provides protection from wear under shock loads and fretting conditions.

Features & Benefits

Mobilgrease XHP greases are leading members of the Mobilgrease brand of products, which has gained a reputation world-wide for innovation and performance excellence. Mobilgrease XHP greases are state-of-the-art products designed by our formulation technologists and backed by our world-wide technical support staff.

A key factor in the excellent adhesion and cohesion properties and high drop point of Mobilgrease XHP is the proprietary manufacturing technology developed at our research facilities and adopted by our modern manufacturing facilities. These products use specially selected additives to provide excellent oxidation stability, rust & corrosion control, resistance to water contamination as well as anti-wear and EP protection. Mobilgrease XHP Series products offer the following features and potential benefits:

Features	Advantages and Potential Benefits
Superb resistance to water washout and spray-off	Assures proper lubrication and protection even in the most severe water exposure conditions
Highly adhesive and cohesive structure	Excellent grease tenacity, reduced leakage and extended re-lubrication intervals for reduced maintenance requirements.
Excellent rust and corrosion resistance	Protection of lubricated parts even in hostile aqueous environments, especially acidic water
Very good resistance to thermal, oxidative and structural degradation at high temperature	Extended grease life and enhanced bearing protection in high temperature applications offers reduced maintenance and replacement cost benefits.
Very good anti-wear and EP performance	Reliable protection of lubricated equipment, even under conditions of high sliding and shock loading with potential for extended equipment life and reduced unanticipated downtime
Broad multi-purpose application	Provides potential for inventory rationalisation and reduced inventory costs

ExxonMobil Lubricants & Specialties
This information relates only to products supplied in Europe (including Turkey) and the Former Soviet Union. All products may not be available locally. For more information, contact your local sales office or visit www.exxonmobil.com.
ExxonMobil is comprised of numerous affiliates and subsidiaries, many with names that include Esso, Mobil, or ExxonMobil. Nothing in this document is intended to override or supersede the corporate separateness of these entities. Responsibility for local action and accountability remains with the local ExxonMobil-affiliate entities. Due to continual changes in the corporate structure of ExxonMobil, the information contained herein is subject to change without notification. Typical Properties may vary slightly.
© 2001 Exxon Mobil Corporation. All rights reserved.



Applications

Mobilgrease XHP greases are used in a wide range of equipment including industrial, automotive, construction and marine applications:

- Mobilgrease XHP 103 is recommended for severe applications where good high temperature and anti-leakage properties are required. It is particularly recommended for electric motor bearings, severe truck wheel bearing applications or for rolling element bearings subject to vibration.
- Mobilgrease XHP 221 provides a heavier lubrication film thickness than Mobilgrease XHP 103 while the NLGI 1 Grade ensures better low temperature performance and pumpability.
- Mobilgrease XHP 222 is recommended for industrial and automotive antifriction bearings, chassis components, universal joints and disc brake wheel bearings. It finds particular application in passenger cars, light trucks, taxi fleets and farm equipment. It is also recommended for marine, paper mill, sugar mill and mining applications
- Mobilgrease XHP 461 is recommended for construction and mining equipment, paper and steel mills and other heavy-duty applications.
- Mobilgrease XHP 322 Special is primarily recommended in mining and construction equipment operating under heavy loads or vibrations where the molybdenum disulphide will provide additional wear protection. It is also used in highly loaded plain and antifriction industrial bearings and in heavy-duty trucks especially for hinges, king pins, fifth wheels and bucket pins.

Typical Properties

Mobilgrease XHP	103	221	222	223	322	Special	461
NLGI Grade	3	1	2	3	2	1 1/2	
Thickener Type	Li-Complex	Li-Complex	Li-Complex	Li-Complex	Li-Complex	Li-Complex	Li-Complex
Color, Visual	Dark Blue	Dark Blue	Dark Blue	Dark Grey-Black	Dark Grey-Black	Dark Grey-Black	Dark Grey-Black
Penetration, Worked, 25°C, ASTM D 217	235	325	280	235	280	305	305
Dropping Point, °C, ASTM D 2265	280	280	280	280	280	280	280
Viscosity of Oil, ASTM D 445	100	220	220	220	320	460	460
Penetration Consistency Change, Roll Stability, ASTM D 1831, mm/10	10	10	-8	10	-3	10	10
4-Ball Wear Test, ASTM D 2266, scar, mm	0.5	0.5	0.5	0.5	0.5	0.5	0.5
4-Ball Weld Load, ASTM D 2509, kg	315	315	315	315	315	315	315
Timken OK Load, ASTM D 2509, lb	45	45	45	45	45	45	45
Bomb Oxidation, ASTM D 942, Pressure drop at 100 h, kPa	35	35	35	35	35	35	35
Corrosion Prevention, ASTM D 1743	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Emcor Rust, IP 220, Acidic Water	0	0	0	0	0	0	0
Rust Protection, IP 220-mod, Distilled Water Washout	0	0	0	0	0	0	0
Copper Strip Corrosion, ASTM D 4048	1A	1A	1A	1A	1A	1A	1A
Water Spray Resistance, ASTM D 4049, % Spray-off	15	15	15	15	15	15	15
Water Washout, ASTM D 1264, wt % loss at 79°C	5	8	5	5	5	6	5

ExxonMobil Lubricants & Specialties
This information relates only to products supplied in Europe (including Turkey) and the Former Soviet Union. All products may not be available locally. For more information, contact your local sales office or visit www.exxonmobil.com.
ExxonMobil is comprised of numerous affiliates and subsidiaries, many with names that include Esso, Mobil, or ExxonMobil. Nothing in this document is intended to override or supersede the corporate separateness of these entities. Responsibility for local action and accountability remains with the local ExxonMobil-affiliate entities. Due to continual changes in the corporate structure of ExxonMobil, the information contained herein is subject to change without notification. Typical Properties may vary slightly.
© 2001 Exxon Mobil Corporation. All rights reserved.





Health & Safety

Based on available information, this product is not expected to produce adverse effects on health when used for the intended application and the recommendations provided in the Material Safety Data Sheet (MSDS) are followed. MSDS's are available upon request through your sales contract office, or via the Internet. This product should not be used for purposes other than its intended use. If disposing of used product, take care to protect the environment.

The Mobil logotype, the Pegasus design are trademarks of Exxon Mobil Corporation, or one of its subsidiaries.



ExxonMobil Lubricants & Specialties
This information relates only to products supplied in Europe (including Turkey) and the Former Soviet Union. All products may not be available locally. For more information, contact your local sales office or visit www.exxonmobil.com.
ExxonMobil is comprised of numerous affiliates and subsidiaries, many with names that include Esso, Mobil, or ExxonMobil. Nothing in this document is intended to override or supersede the corporate separateness of local entities. Responsibility for local action and accountability remains with the local ExxonMobil-affiliate entities. Due to continual product and service improvements, the information contained herein is subject to change without notification. Typical Properties may vary slightly.
© 2001 Exxon Mobil Corporation. All rights reserved.



Mobil Almo 500 Series

Pneumatic Rock Drill and Tool Lubricants

Product Description

Mobil Almo 500 Series lubricants are premium quality high performance products primarily intended for the lubrication of pneumatically operated rock drills in underground and surface mining operations. The Mobil Almo Series oils are formulated from high quality base stocks and additives, which provide excellent chemical stability and good protection against wear and corrosion. They offer an optimum balance of adhesiveness, yet are emulsifiable enough to pick up moisture carried in the air stream reducing the negative effects of water on wear and corrosion. They do not form gummy deposits that could cause sluggish valve action. Even in the presence of water, the Mobil Almo 500 Series oils have good preferential metal-wetting properties that maintain continuous oil films. These properties in combination with high EP characteristics help provide excellent lubrication resulting in long equipment life.

Mobil Almo 500 Series possess high viscosity indexes and low pour points to ensure good lubrication at the low temperatures resulting from air expansion and guard against icing stoppages while providing adequate films on drill parts that may operate at high temperatures. Oil fog generation levels are extremely low.

Features & Benefits

The Mobil Almo 500 Series oils provide an optimum performance balance which assures long equipment life and minimal maintenance costs. Their excellent wear protection characteristics and ability to provide adequate lubrication in the presence of water not only reduces wear but protects against rust and corrosion. Their good chemical stability prevents sludge and deposit formation reducing the need for frequent maintenance.

Features	Advantages and Potential Benefits
Effective Chemical Stability	Reduce sludge and deposit formation
Desired Emulsifiable Properties	Improves valve operation
High Viscosity Index	Effective lubrication in presence of water
Excellent Load Carrying Ability and Anti-Wear Protection	Provides good lubrication at both high and low temperatures
Very Good Adhesive Characteristics	Reduces component wear
Rust and Corrosion	Prolongs equipment life
	Reduces maintenance costs
	Protects metal surfaces from corrosion
	Provides good lubricant films under all conditions
	Longer tool life
	Increased tool performance



ExxonMobil Lubricants & Specialties
Alamo, California. For more information, contact your local sales office or visit www.exxonmobil.com.
ExxonMobil is comprised of numerous affiliates and subsidiaries, many with names that include Esso, Mobil, or ExxonMobil. Nothing in this document is intended to override or supersede the corporate separateness of local entities. Responsibility for local action and accountability remains with the local ExxonMobil affiliate entities. Due to continual product research and development, the information contained herein is subject to change without notification. Typical Properties may vary slightly.
© 2001 Exxon Mobil Corporation. All rights reserved.



Applications

Mobil Almo 500 Series oils are recommended for use in all pneumatically operated rock drills in both underground and surface mining as well as in contractor and other industrial applications. They are suitable for percussive- and rotary- type tools. The viscosity grades allow selection for year-round use where seasonal ambient temperature variations are extreme.

- Pneumatically operated rock drills in underground and surface mining operations
- Pneumatically operated drills and jack hammers in highway construction and building operations
- Rock drills in quarry operations
- Percussion and rotary air-operated tools in industrial applications

Specifications & Approvals

Meets or Exceeds the following industry specifications	Mobil Almo 525	Mobil Almo 527	Mobil Almo 529	Mobil Almo 532
Ingersoll Rand Rock Drill Oil Light	X			
Ingersoll Rand Rock Drill Oil Medium		X		
Ingersoll Rand Rock Drill Oil Heavy			X	X

Typical Properties

	Mobil Almo 525	Mobil Almo 527	Mobil Almo 529	Mobil Almo 532
ISO Viscosity Grade	46			320
Viscosity, ASTM D 445				
cSt @ 40° C	46	112.9	172	320
cSt @ 100° C	7.3	11.4	16.5	24.9
Viscosity Index, ASTM D 2270	105	91	102	99
Pour Point, °C, ASTM D 97	-24	-30	-24	-21
Flash Point, °C, ASTM D 92, min	188	204	232	232
Density @ 15.6° C, ASTM D 4052, kg/L	0.883	0.899	0.893	0.902



ExxonMobil Lubricants & Specialties
Alamo, California. For more information, contact your local sales office or visit www.exxonmobil.com.
ExxonMobil is comprised of numerous affiliates and subsidiaries, many with names that include Esso, Mobil, or ExxonMobil. Nothing in this document is intended to override or supersede the corporate separateness of local entities. Responsibility for local action and accountability remains with the local ExxonMobil affiliate entities. Due to continual product research and development, the information contained herein is subject to change without notification. Typical Properties may vary slightly.
© 2001 Exxon Mobil Corporation. All rights reserved.



Health & Safety

Based on available information, this product is not expected to produce adverse effects on health when used for the intended application and the recommendations provided in the Material Safety Data Sheet (MSDS) are followed. MSDS's are available upon request through your sales contract office, or via the Internet. This product should not be used for purposes other than its intended use. If disposing of used product, take care to protect the environment.

The Mobil logotype, the Pegasus design and Delvac are trademarks of ExxonMobil Corporation, or one of its subsidiaries.



ExxonMobil Lubricants & Specialties
ExxonMobil is a registered service mark of ExxonMobil Corporation. For more information, contact your local sales office or visit www.exxonmobil.com.
ExxonMobil is comprised of numerous affiliates and subsidiaries, many with names that include Esso, Mobil, or ExxonMobil. Nothing in this document is intended to override or supersede the corporate separateness of local entities. Responsibility for local action and accountability remains with the local ExxonMobil affiliate entities. Due to continual product research and development, the information contained herein is subject to change without notification. Typical Properties may vary slightly.
© 2001 Exxon Mobil Corporation. All rights reserved.

Product Information



RENISO TRITON SE/SEZ

Fully synthetic refrigeration oils based on polyolesters
for chlorine-free refrigerants, e.g. R134a, R404A

Recommendations:

Compressor Units	SEZ 15	SEZ 22	SEZ 32	SEZ 32	SE 55	SEZ 68	SEZ 80	SEZ 100	SE 170	SE 220
R134a										
Refrigerators	1	1	2	4	4	4	4	4	4	4
Household refrigerators	2	1	1	3	4	4	4	4	4	4
Semi-hermetical and hermetical compressors	4	2	1	2	2	3	3	4	4	4
Open compressors	4	3	1	1	1	1	2	2	4	4
Screw compressors	4	3	3	3	3	3	3	2	1	1
Turbocompressors	4	4	4	1	1	1	2	2	4	4
A/C systems for pass. vehicles	4	4	4	1	1	1	2	2	4	4
R23										
Piston and screw-type compressors	2	1	1	4	4	4	4	4	4	4

Rating: 1 very good 4 not recommended

PI 4-1255, Page 4 - PMI 4 / 08.04

The above information is supplied to the best of our knowledge and belief on the basis of the current state-of-the-art and our own development work. Subject to amendment.

FUCHS EUROPE SCHMIERSTOFFE GMBH
Friesenheimer Str. 15
D - 68169 Mannheim
Tel. ++49-621-3701 0
Fax. ++49-621-3701 570
E-Mail zentrale@fuchs-europe.de

Product Information



RENISO TRITON SE/SEZ

Fully synthetic refrigeration oils based on polyolesters
for chlorine-free refrigerants, e.g. R134a, R404A

Typical technical data:

Product name	SEZ 68	SEZ 80	SEZ 100	SE 170	SE 220		
Properties	Unit	Test method					
Density at 15°C	kg/m³	1011	1004	995	972	980	DIN 51 757
Flash point	°C	258	275	288	260	285	DIN ISO 2592
Color	-	0.5	0.5	1.0	1.0	0.5	DIN ISO 2049
Kinematic viscosity at 40 °C	mm²/s	65.6	82	100	173	235	DIN 51 562-1
at 100 °C	mm²/s	9.5	10.3	11.8	17.6	20.7	
Viscosity index	-	125	108	107	111	103	DIN ISO 2909
Pour point	°C	-45	-39	-39	-24	-27	DIN ISO 3016
Neutralization number	mgKOH/g	0.03	0.03	0.03	0.03	0.01	DIN 51 558-3
Water content	mg/kg	< 50	< 50	< 50	< 50	< 50	DIN 51 777-1

PI 4-1255, Page 3 - PMI 4 / 08.04

The above information is supplied to the best of our knowledge and belief on the basis of the current state-of-the-art and our own development work. Subject to amendment.

FUCHS EUROPE SCHMIERSTOFFE GMBH
Friesenheimer Str. 15
D - 68169 Mannheim
Tel. ++49-621-3701 0
Fax. ++49-621-3701 570
E-Mail zentrale@fuchs-europe.de

**RENISO TRITON SE/SEZ**

Fully synthetic refrigeration oils based on polyolesters
for chlorine-free refrigerants, e.g. R134a, R404A

Typical technical data:

Product name	SEZ 15	SEZ 22	SEZ 32	SE 55
Properties	Unit	Test method		
Density at 15°C	kg/m ³	1023	998	1007
Flash point	°C	210	240	270
Color	-	0.5	1.0	1.0
Kinematic viscosity at 40 °C	mm ² /s	15.6	19	32
at 100 °C	mm ² /s	3.6	4.2	6.1
Viscosity index	-	112	130	141
Pour point	°C	-54	-54	-48
Neutralization number	mgKOH/g	0.03	0.03	0.03
Water content	mg/kg	< 50	< 50	< 50

PI 4-1255, Page 2 - PIM 4 / 08.04

The above information is supplied to the best of our knowledge and belief on the basis of the current state-of-the-art and our own development work. Subject to amendment.

FUCHS EUROPE SCHMIERSTOFFE GMBH
Friesenheimer Str. 15
D - 68169 Mannheim
Tel. ++49-621-3701 0
Fax. ++49-621-3701 570
E-Mail zentrale@fuchs-europe.de

**RENISO TRITON SE/SEZ**

Fully synthetic refrigeration oils based on polyolesters
for chlorine-free refrigerants, e.g. R134a, R404A

Description

The refrigeration oils of the RENISO TRITON SE/SEZ series are based on synthetic esters that were especially developed for use with chlorine-free, fluorinated hydrocarbons (HFC/FC). In contrast to conventional refrigeration oils, these are miscible and compatible with polar HFC/FC.

Application

The RENISO TRITON SE/SEZ series is outstandingly suited for all refrigeration circuits, in which chlorine-free HFC/FC refrigerants, e.g. R134a, R404A or R410A are used. Depending on the viscosity, RENISO TRITON SE/SEZ refrigeration oils are recommended for hermetic, semi-hermetic and open piston compressors and for screw-type and turbo-compressors. RENISO TRITON SEZ 22 is especially suitable for deep-freeze systems operating with R23.

Note

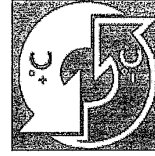
Because of their chemical structure, ester-based oils tend to absorb water. For this reason, RENISO TRITON SE/SEZ should be in contact with ambient air only for a short time. When opened, the content must be filled immediately in the system. Remaining fluid must be used within one day.

Advantages/ Benefits

- Special synthetic polyolester
- Stable lubrication film even at high temperatures, outstanding lubricity
- Excellent solubility with HFC and FC refrigerants
- Very high thermal and chemical stability in the presence of fluorinated refrigerants
- Good viscosity-temperature behavior
- Excellent cold temperature flowability
- Secure oil return from the system, good heat transfer
- Good compatibility with elastomers and materials normally used in refrigeration circuits

- Approved by leading compressor manufacturers

- Ultra-dried



PI 4-1255, Page 1 - PIM 4 / 08.04

The above information is supplied to the best of our knowledge and belief on the basis of the current state-of-the-art and our own development work. Subject to amendment.

FUCHS EUROPE SCHMIERSTOFFE GMBH
Friesenheimer Str. 15
D - 68169 Mannheim
Tel. ++49-621-3701 0
Fax. ++49-621-3701 570
E-Mail zentrale@fuchs-europe.de

R-227ea

1,1,1,2,3,3,3 – HEPTAFLUOROPROPANE CF₃-CHF-CF₃

GUARANTEED COMMERCIAL SPECIFICATIONS

STANDARD SPECIFICATIONS	LIMIT VALUE
Purity	≥ 99.5 % weight
Water content	≤ 10 ppm weight
Chlorine ion test (silver nitrate test)	Negative
Total acidity (HCl)	≤ 1 ppm weight
Non-condensable content (gas phase)	≤ 0.01 % volume
High-boiling residues	≤ 0.01 % volume

MAIN APPLICATIONS

R-227ea is a hydrofluorocarbon (HFC) intended for replacing R-114 (CFC) whose production was stopped in the European Union on 12.31.1994.

It is particularly suitable for air conditioning devices functioning in high temperature environments, high temperature heat pumps, and thermal collectors.

R-227ea is also used as an extinction agent replacing "fluorocarbon-bromide" compound R-13B1 whose production was stopped in the European Union as of 31.12.1993.

OILS

Use a polyol ester (POE) oil.

Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

PRECAUTIONS OF USE

Refer to the Safety Data Sheet*.

REGULATION

In Europe, R-227ea recovery is mandatory as per regulation n° 842/2006.
(Refer to regulations enforced in each country)

* Find the Safety Data Sheet (SDS) directly on our website www.climalife.dehon.com

R-227ea PHYSICO-CHEMICAL PROPERTIES

Molar mass	g/mol	170.03
Melting point	°C	-127
Boiling point (under 1.013 bar)	°C	-15.61
Saturated fluid density at 25°C	kg/m ³	1387
Saturated vapour density at boiling point	kg/m ³	8.452
Vapour tension at 20°C	bar	3.895
Critical temperature	°C	101.74
Critical pressure	bar	29.3
Critical density	kg/m ³	584
Latent heat of vaporisation at boiling point	KJ/kg	131.9
Thermal conductivity at 25°C		
Liquid	W/(m.K)	0.0533
Vapour under 1.013 bar		0.01252
Vapour tension at 25°C	bar	6.980
Viscosity at 25°C		
Liquid	10 ⁻³ Pa-s	0.244
Vapour under 1.013 bar		0.01158
Specific heat capacity at 25°C		
Liquid	KJ/(kg.K)	1.176
Vapour under 1.013 bar	KJ/(kg.K)	0.81
Cp/Cv ratio at 25°C under 1.013 bar		1.074
Flammability in air		non-flammable
Flashing point		None
NF-EN 378 classification		-
Potential effect on ozone	(R-11 = 1)	0

Please contact your distributor or **Climalife** sales department for more information. Also, if the refrigerated system you want to install does not appear to you as a typical case, we are at your service to provide opinions and advices.

The information contained in this product sheet is the result of our studies and experience. It is provided in good faith, but should not, under any circumstance, be taken to constitute a guarantee on our part or an assumption of our responsibility. This is particularly the case when third party rights are at stake or in situations where a user of one of our products fails to observe applicable regulations.



Loctite Corporation
1001 Trout Brook Crossing
Rocky Hill, CT 06067-3910
Telephone: (860) 571-5100
FAX: (860) 571-5465

Technical Data Sheet

Product 767

Industrial Products, October 1998

PRODUCT DESCRIPTION

LOCTITE® Product 767 is a heavy-duty, high-temperature anti-seize thread compound applicable for heavy pressure applications. It can be used in high temperature areas up to 870°C (1600°F).

TYPICAL APPLICATIONS

Product 767 is used to lubricate and to permit easy disassembly of assemblies exposed to high temperatures and heavy contact pressures, such as boiler and oven parts, jet engines, and industrial turbines.

PROPERTIES OF MATERIAL

Chemical Type	Value	Typical	Range
Appearance	Synthetic grease Aluminum (silver) paste		
Specific Gravity @ 25°C	1.17 (base)		
Viscosity @ 25°C mPa.s (cP)	200,000	150,000 to 250,000	
Brookfield RVT, Helipath			
Spindle TD @ 5 rpm			
Flash Point (TCC)			
Concentrate, °C (°F)	>93 (>200)		
Propellant, °C (°F)	-104 (-156)		
Particle Size(µm)	22.5		

TYPICAL PERFORMANCE PROPERTIES

Static Coefficient of Friction

The following chart shows the static coefficient of friction between controlled mating surfaces subjected to a compressive stress that approximates the bearing stress acting on fastener threads under load (60% of proof for a 3/8-16 Grade 5 steel).

Temperature	Coefficient of Friction
-65°F (-54°C)	0.043
68°F (20°C)	0.077
1400°F (870°C)	0.164

Torque Tension

Tested on degreased 3/8x16 nuts & bolts in a Skidmore-Wilhelm apparatus. Data reported are the k-factors calculated from torque @ 5000 lbs tension.

Lubricity "k" Factor 0.18

CAUTION

Product 767 is not a high-speed load carrying lubricant and should not be used on ball or roller bearings, or on parts where lubrication is critical.

Torque vs. Elevated Temperatures

The following chart shows break and prevail torque values for plain steel 3/8-16 fasteners degreased, coated, pre-torqued to 30 ft-lbs, heat soaked at an elevated temperature for 24 hours, cooled to room temperature and disassembled. (No signs of galling or seizing were visible.)

Temperature	Break	Prevail
-54°C (-55°F)	270	6
22°C (72°F)	264	6
537°C (1000°F)	96	7
760°C (1400°F)	262	160
870°C (1600°F)	132	89

Corrosion Resistance

Degreased steel specimens (3/8-16 Grade 5 bolts) were treated with an even coating of Anti-seize and assembled into test blocks of aluminum and carbon steel drilled and tapped with 3/8-16 holes. A small amount of Anti-seize was applied under the bolt heads where high bearing stresses are present. The assemblies were placed in a 95°F condensing humidity salt fog chamber for 180 hours. After conditioning, the bolts were removed and inspected visually for corrosion both in the threads and under the bolt heads. There were no visible signs of corrosion on any of the treated specimens.

The product was tested for corrosive effects on plain copper strips. There was no sign of corrosion, discoloration, pitting or etching upon completion of the test.

Physical Properties (Base)

	Value	Typical	Range
Unworked Penetration (ASTM D-217)	312	325 to 299	
Worked Penetration (ASTM D-217)	324	310 to 338	
Dropping Point (ASTM D-217) °C	232		
NLGI Grade	1		

Wear Resistance

Extreme pressure testing with a Timken Lubricant Tester (ASTM D2509) indicated Product 767 would resist seizure, scoring and wear under adverse pressure conditions. The test on Anti-seize consisted of a rotating spindle beaded and held constant for a ten-minute interval. If no scoring of the test block was noted, the load was increased and the test run.

The following chart shows the load at which failure occurred. The load at which failure occurs is then reported to be the fail load. The last acceptable load is considered to be the OK load, or non weld load

Load Type	Pressured Applied
OK load, lbs	47
Fail Load, lbs	52
Scar width at failure, mm	0.83
Stress value at failure, N/mm ² (psi)	65 (9458)

Torque, Galling and Seizing

NOT FOR PRODUCT SPECIFICATIONS
THE TECHNICAL DATA CONTAINED HEREIN ARE INTENDED AS REFERENCE ONLY.
PLEASE CONTACT LOCTITE CORPORATION QUALITY DEPARTMENT FOR ASSISTANCE AND RECOMMENDATIONS FOR THIS PRODUCT.
ROCKY HILL, CT FAX: +1 (860) 571-5473 DUBLIN, IRELAND FAX: +353(1)-481-9999

Five (5) bolts, 3/4"-10 were pre-torqued to approximately 230 ft lbs. (based on elongation) then conditioned for three six hour cycles @ 1050°F with retorquing after each cycle. After heating, the entire block assembly was exposed to a 20% salt solution for seven days. Break torque didn't exceed 250 ft lbs. There was no seizing of any nuts during the test. There was no galling evident on the threads of the nuts or studs.

GENERAL INFORMATION

This product is not recommended for use in pure oxygen and/or oxygen rich systems and should not be selected as a sealant for chlorine or other strong oxidizing materials.

For safe handling information on this product, consult the Material Safety Data Sheet (MSDS).

Directions for use

1. For best results, ensure part surfaces are clean and free of debris.
2. Apply a light coating of product to parts requiring lubrication.
3. Assemble parts.
4. When part is assembled, wipe away any excess compound.

Storage

Product shall be ideally stored in a cool, dry location in unopened containers at a temperature between 8°C to 28°C (46°F to 82°F) unless otherwise labeled. Optimal storage is at the lower half of this temperature range. To prevent contamination of unused product, do not return any material to its original container. For further specific shelf life information, contact your local Technical Service Center.

Data Ranges

The data contained herein may be reported as a typical value and/or range. Values are based on actual test data and are verified on a periodic basis.

The data contained herein are furnished for information only and are believed to be reliable. We cannot assume responsibility for the results obtained by others over whose methods we have no control. It is the user's responsibility to determine suitability for the user's purpose of any production methods mentioned herein and to adopt such precautions as may be advisable for the protection of property and of persons against any hazards that may be involved in the handling and use thereof. In light of the foregoing, Loctite Corporation specifically disclaims all warranties expressed or implied, including warranties of merchantability or fitness for a particular purpose, arising from sale or use of Loctite Corporation's products. Loctite Corporation specifically disclaims any liability for consequential or incidental damages of any kind, including lost profits. The discussion herein of various processes or compositions is not to be interpreted as representation that they are free from domination of patents owned by others or as a license under any Loctite Corporation patents that may cover such processes or compositions. We recommend that each prospective user test his proposed application before repetitive use, using this data as a guide. This product may be covered by one or more United States or foreign patents or patent applications.



Texaco Multifak[®] EP

0, 1, 2

Customer Benefits

Texaco Multifak EP greases deliver value through

Good water resistance — Strong resistance to wash out of bearings.

Good rust and corrosion protection, even in wet conditions.

Extreme pressure protection

Protection against shock loading, thus extending bearing life.

Outstanding film strength

Good low temperature pumpability — Better handling in the container and grease dispensing equipment.

Features

Texaco Multifak EP greases are water resistant, extreme pressure, heavy duty chassis, wheel bearing and general purpose lubricating greases.

They are manufactured using highly refined, select high viscosity index base oils, and a lithium soap. They are brown in color and smooth and buttery in texture.

Texaco Multifak EP greases are available in three grades:

- NLGI 0, 1 for better pumpability at low ambient temperatures
- NLGI 2 for use in normal ambient temperatures

Functions

Texaco Multifak EP greases are formulated to:

- Protect bearings and other metal surfaces from corrosion when exposed to wet conditions.
- Resist water. These greases strongly resist being washed out of bearings.
- Retain their consistency under adverse service conditions.
- Provide outstanding film strength and adhesive properties. As a result, Texaco Multifak EP greases are particularly effective in providing low wear in shock load service.
- Operate effectively over a wide temperature range.

Applications

Texaco Multifak EP greases are recommended for

- general use in the lubrication of trucks, tractors, and passenger cars. This includes ball joints, universal joints, and all other chassis points, non-disc brake wheel bearings, water pumps, and fifth wheels.
- boat trailer wheel bearings

Texaco Multifak EP 2 is approved for the NLGI Certification Mark LB.

Typical Test Data

NLGI Grade	0	1	2
CPS Number	220901	220921	220995
MSDS Number	8644	8644	8644
Operating Temperature, °C(°F)			
Minimum ¹	-34(-30)	-34(-30)	-34(-30)
Maximum ²	121(250)	121(250)	121(250)
Penetration, at 25°C(77°F)			
Unworked	390	305	275
Worked	370	325	280
Dropping Point, °C(°F)	171(340)	186(367)	188(370)
Four-Ball			
Weld Point, kg	315	315	315
Wear Scar Diameter, mm	0.5	0.5	0.5
Timken OK Load, lb	40	40	40
Thickener, %	6	9	12
Type	Lithium	Lithium	Lithium
Viscosity, Kinematic*			
cSt at 40°C	173	173	173
cSt at 100°C	15.6	15.6	15.6
Viscosity, Saybolt*			
SUS at 100°F	914	914	914
SUS at 210°F	82	82	82
Viscosity Index*	90	90	90
Flash Point, °C(°F)*	198(388)	198(388)	198(388)
Pour Point, °C(°F)*	-12(+10)	-12(+10)	-12(+10)
Texture	Buttery	Buttery	Buttery
Color	Brown	Brown	Brown

Typical test data are average values only. Minor variations which do not affect product performance are to be expected in normal manufacturing.

¹ Minimum operating temperature is the lowest temperature at which a grease, already in place, could be expected to provide lubrication. Most greases cannot be pumped at these minimum temperatures.

² Maximum operating temperature is the highest temperature at which the grease could be used with frequent (daily) relubrication.

* Determined on mineral oil extracted by vacuum filtration.

2.2 SAFETY DATA SHEETS

1. QUAKER CHEMICAL – QUINTOLUBRIC N888–68
2. MOBIL – MOBILGREASE XHP 322 SPECIAL
3. MOBIL – MOBILGEAR XMP 320
4. MOBIL – MOBIL SHC 630 SERIES
5. MOBIL – MOBILGEAR 600 SERIES
6. MOBIL – MOBIL 1 5W50
7. MOBIL – MOBILARMA MT
8. MOBIL – MOBILGREASE XHP 103
9. MOBIL – ALMO 527
10. FUCHS – RENISO SE 55
11. AIR LIQUIDE – FRIGORIC GAZ R227
12. LOCTITE – LUBRICOMET AS 767 (*)
13. ENERPAC – ENERPAC OIL
14. TEXACO – MULTIFAK EP2

*(NA : NOT AVAILABLE)



SAFETY DATA SHEET
according to Commission Directive 2001/58/EC

Print date: 04/16/2007

Version: 1

Revision date: 04/16/2007

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Identification of the substance or preparation:

Product trade name: **QUINTOLUBRIC 888-46**

Internal code: 056159-05

Use of the substance/preparation:

Application: Hydraulic fluid

Company/undertaking identification:

Supplier: Quaker Chemical B.V.
Industrieweg 1 - 13
1422 AH Uithoorn
The Netherlands
Phone: +31 297 544644
Fax: +31 297 544694
Internet: www.quakerchem.com

Informing department:

Safety, Health and Environmental Affairs Department (SHE)
Phone: +31 297 544484
Fax: +31 297 544481
E-mail: she@quakerchem.com

Technical contact point:

Sales Department Fluid Power
Phone: +31 297 544669

Emergency telephone:

+31 30 2748888 - Nationaal Vergiftigingen Informatie Centrum (NL)
This number is only accessible for the doctor in case of accidental poisoning.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature of the substance or preparation:

Product is a mixture of:
ester, and additives.

Print date: 04/16/2007

Version: 1

Revision date: 04/16/2007

3. HAZARDS IDENTIFICATION

Indication of danger:

None

Most important hazards:

None

4. FIRST AID MEASURES

General advice:

No hazards which require special first aid measures

Inhalation:

Move to fresh air. Consult a physician if necessary.

Skin contact:

Wash off immediately with soap and plenty of water.

Eye contact:

Rinse immediately with plenty of water, also under the eyelids. If symptoms persist, call a physician.

Ingestion:

Do not induce vomiting. Consult a physician.

Notes to physician:

Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Flash Point (°C):

310

Flash point method:

COC

Explosion limits:

- lower: Not applicable

- upper:

Not applicable

Suitable extinguishing media:

Use dry chemical, CO₂, water spray or "alcohol" foam

Extinguishing media which must not be used for safety reasons:

High volume water jet

Special exposure hazards arising from the substance

Carbon monoxide (CO)

or preparation itself, combustion products, resulting gases:

Specific hazards:

No information available

Unusual hazards:

None known

Special protective equipment for fire-fighters:
Standard procedure for chemical fires.

SDS code: 056159-05

Product name: QUINTOLUBRIC 888-46

Page 1 of 8

SDS code: 056159-05

Product name: QUINTOLUBRIC 888-46

Page 2 of 8

Specific methods: Collect contaminated fire extinguishing water separately. This must not be discharged into drains.

6. ACCIDENTAL RELEASE MEASURES

- Personal precautions:** Ensure adequate ventilation.
- Environmental precautions:** Do not flush into surface water or sanitary sewer system.
- Methods for cleaning up:** Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust).

7. HANDLING AND STORAGE

- Handling**
- Technical measures/precautions:** Provide sufficient air exchange and/or exhaust in work rooms.
- Safe handling advice:** In case of insufficient ventilation, wear suitable respiratory equipment.

- Storage**
- Technical measures/storage conditions:** Store at room temperature in the original container
- Incompatible products:** No special restrictions on storage with other products
- Safe storage temperature:** 0 - 40 °C

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

- Exposure Limit Values**
- Further information:** None
- Exposure controls**
- Occupational exposure controls**
- Engineering measures:** Ensure adequate ventilation.
- Respiratory protection:** In case of insufficient ventilation wear suitable respiratory equipment.
- Hand protection:** Neoprene gloves
- Eye protection:** Safety glasses
- Skin and body protection:** Long sleeved clothing
- Environmental exposure controls**
- Recommendations:** none

9. PHYSICAL AND CHEMICAL PROPERTIES

General information

- Physical state:** Liquid
- Color:** Amber
- Odour:** Characteristic

Important health, safety and environmental information

Property	Result	Method
pH:	Not applicable	ASTM D 1293-84
at	100 (%)	-
ASTM D 1293-84		at
		Boiling point/range (°C):
		310
		Flash Point (°C):
		No data available
		Flammability (solid/gas):
		No data available

Explosive properties:

- upper limit: No data available
- lower limit: No data available
- Oxidising properties: No data available
- Vapour pressure: No data available
- Relative density: 0.915 (g/cm3)
- at 15 (°C)

Solubility:

- water solubility: Not soluble
- fat solubility: Not determined
- Partition coefficient (n-octanol/water, log Pow): Not determined

Viscosity:

- at 46 (mm2/s)
- 40 (°C)
- No data available
- Evaporation rate: No data available

Other information

Property	Result	Method
Miscibility:	Not determined	-
Conductivity:	Not determined	-
Melting point/melting range (°C):	<-20	-
Gas group:	Not determined	-
Auto-ignition temperature:	Not determined	-
Molecular weight:	Not determined	-
Decomposition temperature:	Not determined	-

10. STABILITY AND REACTIVITY

10. STABILITY AND REACTIVITY

Stability:

Stable under recommended storage conditions.

Conditions to avoid:

None known

Materials to avoid:

Strong oxidising agents

Hazardous decomposition products:

None under normal use

Polymerization:

Not applicable

11. TOXICOLOGICAL INFORMATION

Acute toxicity

LD50 (oral/rat): > 5000 mg/kg (calculated)

Long-term effects

Other long-term effects: No data available

Local effects

Oral: No data available

Inhalation: No data available

Skin irritation: No skin irritation

Eye irritation: Contact with eyes may cause irritation

Sensitization: May cause sensitization of susceptible persons

Additional toxicological information: None

12. ECOLOGICAL INFORMATION

Ecotoxicity

Inhibitory effects: None known

Behaviour in sewage treatment plants: None known

Mobility

Distribution to environmental compartments: No data available

Surface tension: No data available

Persistence and degradability

BOD Not determined

Potential degradation: Not determined

Degradation half life: Not determined

Degradation in sewage treatment plants: Not determined

Bioaccumulative potential

Bioaccumulation: No data available

Other adverse effects

Ozone depletion potential (R-11 = 1): Not determined

Photochemical ozone creation potential: Not determined

Global warming potential: Not determined

13. DISPOSAL CONSIDERATIONS

Waste from residues/unused products: Dispose of in accordance with local regulations

Contaminated packaging: Dispose of as unused product.

Methods for cleaning up: No information available

EWG waste disposal No.: 130103 - non chlorinated hydraulic oils (not emulsions)

14. TRANSPORT INFORMATION

ADR Class: Not classified

RID Class: Not classified

IMO/IMDG Class: Not classified

ICAO

Sources of key data used to compile the data sheet: Material safety data sheets of the ingredients.

Disclaimer
This product's safety information is provided to assist our customers in assessing compliance with safety/health/environmental regulations. The information contained herein is based on data available to us and is believed to be accurate. However, no warranty of merchantability, fitness for any use, or any other warranty is expressed or implied regarding the accuracy of this data, the results to be obtained from the use thereof, or the hazards connected with the use of the product. Since the use of this product is within the exclusive control of the user, it is the user's obligation to determine the conditions for safe use of the product. Such conditions should comply with all regulations concerning the product. Quaker Chemical Corporation ("Quaker") assumes no liability for any injury or damage, direct or consequential, resulting from the use of this product unless such injury or damage is attributable to the gross negligence of Quaker.

End of Safety Data Sheet

Class: 14. TRANSPORT INFORMATION
Not classified

IATA
Hazard Class: Not classified

15. REGULATORY INFORMATION

EC classification and labelling (67/548/EEC - 1999/45/EC)
Indication of danger: None

R phrases: None
S phrases: None
National regulations

Water endangering class 1
WGK (D):
Maladies Professionnelles (F): Not Listed

EC EINECS/ELINCS/NLP list: This product complies with EINECS.

16. OTHER INFORMATION

List of relevant R phrases
Further information:
Training advice: See our technical data sheet.
Concentration to be used:
- min. (%): 100
- max. (%): 100
Technical contact point: Sales Department Fluid Power
Phone: +31 297 544669
Prepared by: Department for Safety, Health and Environmental Affairs Department - Europe

Product Name: MOBILGREASE XHP 322 SPECIAL
Revision Date: 29Apr2006
Page 1 of 8

SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

As of the revision date above, this (M)SDS meets the regulations in the United Kingdom & Ireland.

PRODUCT

Product Name: MOBILGREASE XHP 322 SPECIAL
Product Description: Base Oil and Additives
Product Code: 2019A0202536, 406737, 530584-60
Intended Use: Grease

COMPANY IDENTIFICATION

Supplier: EXXONMOBIL LUBRICANTS & SPECIALTIES EUROPE, A DIVISION OF EXXONMOBIL
PETROLEUM & CHEMICAL, BVBA (EMPC)
POLDERDIJKWEG
B-2030 Antwerpen
Belgium

24 Hour Environmental / Health Emergency (UK) 01372 222 000 / (IRELAND) 44 1372 222 000
Telephone

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

Reportable Hazardous Substance(s) or Complex Substance(s)

Name	CAS#	ELINCS	Concentration*	Symbols/Risk Phrases
ALKYLATED DIPHENYL AMINES	68411-46-1	270-128-1	< 2.5%	N/R51/53
MOLYBDENUM (IV) SULPHIDE	1317-33-5	215-263-9	1 - 5%	None
PHOSPHORODITHIOIC ACID O,O-DI C-1-14-ALKYL ESTERS, ZINC SALTS (2:1) (ZDDP)	68649-42-3	272-028-3	< 2.5%	Xi/R36/38, N/R51/53

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

SECTION 3 HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines see Section 15.

HEALTH HAZARDS

Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

Note: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

Product Name: MOBILGREASE XHP 322 SPECIAL
Revision Date: 29Apr2006
Page 2 of 8

SECTION 4 FIRST AID MEASURES

INHALATION

At ambient/normal handling temperatures, minimal or no irritation due to inhalation of vapour/mist is expected.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Aldehydes, Incomplete combustion products, Sulphur Oxides, Smoke, Fume, Oxides of carbon

FLAMMABILITY PROPERTIES

Flash Point [Method]: >204°C (400°F) [EST. FOR OIL, ASTM D-92 (COC)]
Flammable Limits (Approximate volume % in air): LEL: N/D UEL: N/D
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

Product Name: MOBILGREASE XHP 322 SPECIAL
Revision Date: 29Apr2006
Page 3 of 8

SPILL MANAGEMENT

Land Spill: Allow spilled material to solidify and shovel it up into a suitable container for recycle or disposal.
Scrape up spilled material with shovels into a suitable container for recycle or disposal.

Water Spill: Stop leak if you can do so without risk. Confine the spill immediately with booms. Skim from surface

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Prevent small spills and leakage to avoid slip hazard.

Static Accumulator: This material is not a static accumulator.

STORAGE

Do not store in open or unlabelled containers.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit/Standard	Note	Source	Year
MOLYBDENUM (IV) SULPHIDE [as Mo]	Inhalable fraction.	TWA 10 mg/m3		ACGIH	2005
MOLYBDENUM (IV) SULPHIDE [as Mo]	Respirable fraction.	TWA 0.5 mg/m3		ACGIH	2005

Information about recommended monitoring procedures can be obtained from the following agency(ies)/institute(s):
France: L'Institut National de Recherche et de Sécurité (INRS) Germany: Berufsgenossenschaftliches Institut für Arbeitssicherheit (BIA) UK: Health and Safety Executive (HSE)

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:
No special requirements under ordinary conditions of use and with adequate ventilation.

Product Name: MOBILGREASE XHP 322 SPECIAL
Revision Date: 29Apr2006
Page 4 of 8

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:
No protection is ordinarily required under normal conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Work conditions can greatly effect glove durability; inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:
No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:
No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State: Solid
Form: semi-fluid
Colour: grey
Odour: Characteristic
Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.919
Flash Point [Method]: >204°C (400°F) [EST. FOR OIL, ASTM D-92 (COC)]
Flammable Limits (Approximate volume % in air): LEL: N/D UEL: N/D

Product Name: MOBILGREASE XHP 322 SPECIAL
Revision Date: 29Apr2006
Page 5 of 8

Autoignition Temperature: N/D
Boiling Point / Range: > 316°C (600°F)
Vapour Density (Air = 1): N/D
Vapour Pressure: < 0.013 kPa (0.1 mm Hg) at 20°C
Evaporation Rate (N-Butyl Acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: 320 cSt (320 mm²/sec) at 40°C
Oxidising properties: See Sections 3, 15, 16.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: 260°C (500°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt

Note: Most physical properties above are for the oil component in the material.

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidisers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

Acute Toxicity

Route of Exposure	Conclusion / Remarks
INHALATION	
Toxicity: LC50 > 5000 mg/m3	Minimally Toxic. Based on assessment of the components.
Irritation: No end point data.	Not determined.
INGESTION	
Toxicity: LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity: LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: Data available.	Negligible irritation to skin at ambient temperatures. Based on assessment of the components.
Eye	
Irritation: Data available.	May cause mild, short-lasting discomfort to eyes. Based on assessment of the components.

Product Name: MOBILGREASE XHP 322 SPECIAL
Revision Date: 29Apr2006
Page 6 of 8

CHRONIC/OTHER EFFECTS

Contains:

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346. Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitising in test animals.

Additional information is available by request.

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

European Waste Code: 12 01 12

NOTE: These codes are assigned based upon the most common uses for this material and may not reflect contaminants resulting from actual use. Waste producers need to assess the actual process used when generating the waste and its contaminants in order to assign the proper waste disposal code(s).

This material is considered as hazardous waste pursuant to Directive 91/689/EEC on hazardous waste, and

Product Name: MOBILGREASE XHP 322 SPECIAL
Revision Date: 29Apr2006
Page 7 of 8

subject to the provisions of that Directive unless Article 1(5) of that Directive applies.

Empty Container Warning (where applicable): Empty containers may retain residue and can be dangerous. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT. FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

SECTION 14 TRANSPORT INFORMATION

LAND (ADR/RID) : Not Regulated for Land Transport

INLAND WATERWAYS (ADNR) : Not Regulated for Inland Waterways Transport

SEA (IMDG) : Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA) : Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

Material is not dangerous as defined by the EU Dangerous Substances/Preparations Directives.

EU LABELING: Not regulated according to EC Directives

Contains: ZINC SULFONATE May produce an allergic reaction. This material contains one or more sensitisers <1.0% by weight which are not identified in Section 2.

REGULATORY STATUS AND APPLICABLE LAWS AND REGULATIONS

Complies with the following national/regional chemical inventory requirements: AICS, DSL, EINECS, ENCS, TSCA

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable
KEY TO THE RISK CODES CONTAINED IN SECTION 2 AND 3 OF THIS DOCUMENT (for information only):
R36: Irritating to eyes.
R38: Irritating to skin.
R51/53: Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Revision Changes: Not Applicable

Product Name: MOBILGREASE XHP 322 SPECIAL
Revision Date: 29Apr2006
Page 8 of 8

The information and recommendations contained herein are, to the best of ExxonMobil's knowledge and belief, accurate and reliable as of the date issued. You can contact ExxonMobil to insure that this document is the most current and available from ExxonMobil. The information and recommendations are offered for the user's consideration and examination. It is the user's responsibility to satisfy itself that the product is suitable for the intended use. If buyer repackages this product, it is the user's responsibility to insure proper health, safety and other necessary information is included with and/or on the container. Appropriate warnings and safe-handling procedures should be provided to handlers and users. Alteration of this document is strictly prohibited. Except to the extent required by law, re-publication or retransmission of this document, in whole or in part, is not permitted. The term, "ExxonMobil" is used for convenience, and may include any one or more of ExxonMobil Chemical Company, Exxon Mobil Corporation, or any affiliates in which they directly or indirectly hold any interest.

Internal Use Only
MHC: 0, 0, 0, 0, 0, 0 PPEC: A
DGN: 2006165XGB (550247)

Product Name: MOBILGEAR XMP 320
Revision Date: 31Oct2008
Page 1 of 8

SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

As of the revision date above, this (M)SDS meets the regulations in the United Kingdom & Ireland.

PRODUCT

Product Name: MOBILGEAR XMP 320
Product Description: Base Oil and Additives
Product Code: 201560403530, 405419, 610642-60
Intended Use: Gear oil
COMPANY IDENTIFICATION
Supplier: EXXONMOBIL LUBRICANTS & SPECIALTIES EUROPE, A DIVISION OF EXXONMOBIL PETROLEUM & CHEMICAL, BVBA (EMPC)
POLDERDIJKWEG
B-2030 Antwerpen
Belgium

24 Hour Environmental / Health Emergency (UK) 01372 222 000 / (IRELAND) 44 1372 222 000
Telephone
e-mail SDS-UK@EXXONMOBIL.COM

SECTION 2 HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines see Section 15.

HEALTH HAZARDS

Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

Note: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

No Reportable Hazardous Substance(s) or Complex Substance(s).

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

Product Name: MOBILGEAR XMP 320
Revision Date: 31Oct2008
Page 2 of 8

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Smoke, Fume, Aldehydes, Sulphur Oxides, Incomplete combustion products, Oxides of carbon

FLAMMABILITY PROPERTIES

Flash Point [Method]: >204C (399F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do so without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do so without risk. Confine the spill immediately with booms. Warn other

Product Name: MOBILGEAR XMP 320
Revision Date: 31Oct2008
Page 3 of 8

shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material: however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Prevent small spills and leakage to avoid slip hazard.

Static Accumulator: This material is a static accumulator.

STORAGE

Do not store in open or unlabelled containers. Keep away from incompatible materials.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits/standards for materials that can be formed when handling this product: When mists / aerosols can occur, the following are recommended: 5 mg/m³ - ACGIH TLV, 10 mg/m³ - ACGIH STEL.

Note: Information about recommended monitoring procedures can be obtained from the relevant agency(ies)/institute(s):

UK Health and Safety Executive (HSE)

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

Product Name: MOBILGEAR XMP 320
Revision Date: 31Oct2008
Page 4 of 8

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State: Liquid

Colour: brown

Odour: Characteristic

Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.9

Flash Point [Method]: >204C (399F) [ASTM D-92]

Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0

Autoignition Temperature: N/D

Boiling Point / Range: > 316C (600F)

Vapour Density (Air = 1): > 2 at 101 kPa

Vapour Pressure: < 0.013 kPa (0.1 mm Hg) at 20°C

Evaporation Rate (N-Butyl Acetate = 1): N/D

pH: N/A

Log Pow (n-Octanol/Water Partition Coefficient): > 3.5

Solubility in Water: Negligible

Viscosity: 320 cSt (320 mm²/sec) at 40°C | 24.1 cSt (24.1 mm²/sec) at 100C

Oxidising properties: See Sections 3, 15, 16.

Product Name: MOBILGEAR XMP 320
Revision Date: 31Oct2008
Page 5 of 8

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -12°C (10°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidisers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

Acute Toxicity

Route of Exposure	Conclusion / Remarks
INHALATION	Toxicity: LC50 > 5000 mg/m ³
	Irritation: No end point data.
INGESTION	Toxicity: LD50 > 5000 mg/kg
	Skin
Skin	Toxicity: LD50 > 5000 mg/kg
	Irritation: Data available.
Eye	Irritation: Data available.

CHRONIC/OTHER EFFECTS

For the product itself:

Repeated and/or prolonged exposure may cause irritation to the skin, eyes, or respiratory tract.

Contains:

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitising in test animals.

Product Name: MOBILGEAR XMP 320
Revision Date: 31Oct2008
Page 6 of 8

Additional information is available by request.

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation: Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13

DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

European Waste Code: 13 02 05

NOTE: These codes are assigned based upon the most common uses for this material and may not reflect contaminants resulting from actual use. Waste producers need to assess the actual process used when generating the waste and its contaminants in order to assign the proper waste disposal code(s).

This material is considered as hazardous waste pursuant to Directive 91/689/EEC on hazardous waste, and subject to the provisions of that Directive unless Article 1(5) of that Directive applies.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION.

Product Name: MOBILGEAR XMP 320
Revision Date: 31Oct2008
Page 7 of 8

THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (ADR/RID) : Not Regulated for Land Transport

INLAND WATERWAYS (ADNR) : Not Regulated for Inland Waterways Transport

SEA (IMDG) : Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA) : Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

Material is not dangerous as defined by the EU Dangerous Substances/Preparations Directives.

EU LABELING: Not regulated according to EC Directives

REGULATORY STATUS AND APPLICABLE LAWS AND REGULATIONS

Complies with the following national/regional chemical inventory requirements: AICS, IECSC, DSL, EINECS, ENCS, KECI, PICCS, TSCA

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

- Revision Changes:
- Section 06: Notification Procedures - Header was modified.
 - Section 13: Empty Container Warning was modified.
 - Section 09: Phys/Chem Properties Note was modified.
 - Section 09: Boiling Point °C(°F) was modified.
 - Section 08: Hand Protection was modified.
 - Section 08: Environmental Control - Note was modified.
 - Section 07: Handling and Storage - Storage Phrases was modified.
 - Section 05: Hazardous Combustion Products was modified.
 - Section 06: Accidental Release - Spill Management - Water was modified.
 - Section 09: Relative Density - Header was modified.
 - Section 09: Flash Point °C(°F) was modified.
 - Section 09: Viscosity was modified.
 - Section 08: Environmental Control - Note was modified.

Product Name: MOBILGEAR XMP 320
Revision Date: 31Oct2008
Page 8 of 8

- Section 11: Skin Irritation Conclusion was modified.
- Section 15: National Chemical Inventory Listing was modified.
- Section 16: Code to MHCs was modified.
- Section 11: Inhalation Irritation Test Data was modified.
- Section 11: Oral Lethality Test Data was modified.
- Section 11: Dermal Lethality Test Data was modified.
- Section 01: Company Contact Methods Sorted by Priority was modified.

%%revision_comment%%

The information and recommendations contained herein are, to the best of ExxonMobil's knowledge and belief, accurate and reliable as of the date issued. You can contact ExxonMobil to insure that this document is the most current available from ExxonMobil. The information and recommendations are offered for the user's consideration and examination. It is the user's responsibility to satisfy itself that the product is suitable for the intended use. If buyer repackages this product, it is the user's responsibility to insure proper health, safety and other necessary information is included with and/or on the container. Appropriate warnings and safe-handling procedures should be provided to handlers and users. Alteration of this document is strictly prohibited. Except to the extent required by law, re-publication or retransmission of this document, in whole or in part, is not permitted. The term, "ExxonMobil" is used for convenience, and may include any one or more of ExxonMobil Chemical Company, Exxon Mobil Corporation, or any affiliates in which they directly or indirectly hold any interest.

Internal Use Only

MHC: 0B, 0B, 0, 0, 0

PPEC: A

DGN: 7055225XGB (1010145)

MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

As of the revision date above, this (M)SDS meets the regulations in India.

PRODUCT

Product Name: MOBIL SHC 630
Product Description: Synthetic Base Stocks and Additives
Product Code: 201560500550, 602953
Intended Use: Circulating/gear oil

COMPANY IDENTIFICATION

Supplier:
ExxonMobil Lubricants Private Limited
3rd Floor, Tower A, Signature Towers
South 1, National Highway - 8
Gurgaon - 122 001
Haryana India

Supplier General Contact

91-124-4951300

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

No Reportable Hazardous Substance(s) or Complex Substance(s).

SECTION 3 HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines see Section 15.

HEALTH HAZARDS

Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Smoke, Fume, Aldehydes, Sulphur oxides, Incomplete combustion products, Oxides of carbon

FLAMMABILITY PROPERTIES

Flash Point [Method]: >210C (410F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do so without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do so without risk. Confine the spill immediately with booms. Warn other

shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). When the material is handled in bulk, an electrical spark could ignite any flammable vapors from liquids or residues that may be present (e.g., during switch-loading operations). Use proper bonding and/or earthing procedures. However, bonding and earthing may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator.

STORAGE

The container choice, for example storage vessel, may effect static accumulation and dissipation. Do not store in open or unlabelled containers.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits/standards for materials that can be formed when handling this product: When mists / aerosols can occur, the following are recommended: 5 mg/m³ - ACGIH TLV, 10 mg/m³ - ACGIH STEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use

with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation. Particulate

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use. Viton,Nitrile

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State: Liquid

Colour: Orange

Odour: Characteristic

Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 C): 0.866

Flash Point [Method]: >210C (410F) [ASTM D-92]

Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0

Autoignition Temperature: N/D

Product Name: MOBIL SHC 630
Revision Date: 16 Apr 2010
Page 5 of 8

Boiling Point / Range: > 316C (600F)
Vapour Density (Air = 1): > 2 at 101 kPa
Vapour Pressure: < 0.013 kPa (0.1 mm Hg) at 20 C
Evaporation Rate (n-butyl acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: 220 cSt (220 mm2/sec) at 40 C | 25.2 cSt (25.2 mm2/sec) at 100C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -33C (-27F)

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidisers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Route of Exposure	Conclusion / Remarks
Inhalation Toxicity (Rat): LC50 > 5000 mg/m3	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: No end point data.	Negligible hazard at ambient/normal handling temperatures. Based on assessment of the components.
Ingestion Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin Toxicity (Rabbit): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Negligible irritation to skin at ambient temperatures. Based on test data for structurally similar materials.
Eye Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.

CHRONIC/OTHER EFFECTS

Product Name: MOBIL SHC 630
Revision Date: 16 Apr 2010
Page 6 of 8

Contains:

Synthetic base oils: Not expected to cause significant health effects under conditions of normal use, based on laboratory studies with the same or similar materials. Not mutagenic or genotoxic. Not sensitising in test animals and humans.

Additional information is available by request.

IARC Classification:

The following ingredients are cited on the lists below: None.

1 = IARC 1
--REGULATORY LISTS SEARCHED--
2 = IARC 2A
3 = IARC 2B

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

Material -- Not expected to demonstrate chronic toxicity to aquatic organisms

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

ECOLOGICAL DATA

Ecotoxicity

Test	Duration	Organism Type	Test Results
Aquatic - Acute Toxicity	96 hour(s)	Oncorhynchus mykiss	LL50 1003 mg/l: data for similar materials
Aquatic - Chronic Toxicity	21 day(s)	Water Flea	NOELR 1 mg/l: data for similar materials

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

Product Name: MOBIL SHC 630
Revision Date: 16 Apr 2010
Page 7 of 8

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND : Not Regulated for Land Transport

SEA (IMDG): Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA): Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

Material is not hazardous as defined by the EU Dangerous Substances/Preparations Directives.

EU LABELING: Not regulated according to EC Directives

REGULATORY STATUS AND APPLICABLE LAWS AND REGULATIONS

Complies with the following national/regional chemical inventory requirements: EINECS, TSCA
Special Cases:

Inventory	Status
AICS	Restrictions Apply
IECSC	Restrictions Apply
PICCS	Restrictions Apply

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS: Revision Changes:
Section 04: First Aid Eye - Header was modified.
Section 11: Acute Toxicity Table Header was modified.
Section 09: Colour was modified.
Section 11: Ingestion Acute Lethality - Header was modified.

Product Name: MOBIL SHC 630
Revision Date: 16 Apr 2010
Page 8 of 8

Section 11: Inhalation - Header was modified.
Section 09: Evaporation Rate - Header was modified.
Section 07: Handling and Storage - Handling was modified.
Section 07: Handling and Storage - Storage Phrases was modified.
Section 11: Inhalation Lethality Test Data was modified.
Section 05: Hazardous Combustion Products was modified.
Section 06: Accidental Release - Spill Management - Water was modified.
Section 09: Viscosity was modified.
Section 09: Viscosity was modified.
Section 12: Environmental tox table header was modified.
Section 14: Sea (IMDG) - Header was modified.
Section 14: Air (IATA) - Header was modified.
Section 14: Sea (IMDG) - Default was modified.
Section 14: Air (IATA) - Default was modified.
Section 15: National Chemical Inventory Listing was modified.
Hazard Identification: Hazards Note was modified.
Section 15: Special Cases Table was modified.
Section 08: Hand Protection CEN Standards - AP was modified.
Section 09: Oxidizing Properties was modified.
Section 01: Company Contact Methods Sorted by Priority was modified.
Section 11: Tox Table - Header was modified.
Section 12: Environmental tox table in section 12 was added.
Section 12: Ecological data - Header was added.
Section 12: Ecological data - Header was deleted.
Section 12: Environmental tox table in section 12 was deleted.

The information and recommendations contained herein are, to the best of ExxonMobil's knowledge and belief, accurate and reliable as of the date issued. You can contact ExxonMobil to insure that this document is the most current available from ExxonMobil. The information and recommendations are offered for the user's consideration and examination. It is the user's responsibility to satisfy itself that the product is suitable for the intended use. If buyer repackages this product, it is the user's responsibility to insure proper health, safety and other necessary information is included with and/or on the container. Appropriate warnings and safe-handling procedures should be provided to handlers and users. Alteration of this document is strictly prohibited. Except to the extent required by law, re-publication or retransmission of this document, in whole or in part, is not permitted. The term, "ExxonMobil" is used for convenience, and may include any one or more of ExxonMobil Chemical Company, Exxon Mobil Corporation, or any affiliates in which they directly or indirectly hold any interest.

(AP Core)

DGN: 7076524XIN (1011899)

SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

As of the revision date above, this (M)SDS meets the regulations in the United Kingdom & Ireland.

PRODUCT

Product Name: MOBILGEAR 634
Product Description: Hydrocarbons and Additives
Product Code: 201560401025, 400244, 610907-60
Intended Use: Gear oil

COMPANY IDENTIFICATION

Supplier: EXXONMOBIL LUBRICANTS & SPECIALTIES EUROPE, A DIVISION OF EXXONMOBIL
PETROLEUM & CHEMICAL, BVBA (EMPC)
POLDERDIJKWEG
B-2030 Antwerpen
Belgium

24 Hour Environmental / Health Emergency
Telephone (UK) 01372 222 000 / (IRELAND) 44 1372 222 000
e-mail SDS-UK@EXXONMOBIL.COM

SECTION 2 HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines see Section 15.

HEALTH HAZARDS

Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

Note: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

No Reportable Hazardous Substance(s) or Complex Substance(s).

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Smoke, Fume, Aldehydes, Sulphur Oxides, Incomplete combustion products, Oxides of carbon

FLAMMABILITY PROPERTIES

Flash Point [Method: >200C (392F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do so without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do so without risk. Confine the spill immediately with booms. Warn other

shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Prevent small spills and leakage to avoid slip hazard.

Static Accumulator: This material is a static accumulator.

STORAGE

Do not store in open or unlabelled containers. Keep away from incompatible materials.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits/standards for materials that can be formed when handling this product: When mists / aerosols can occur, the following are recommended: 5 mg/m³ - ACGIH TLV, 10 mg/m³ - ACGIH STEL.

Note: Information about recommended monitoring procedures can be obtained from the relevant agency(ies)/institute(s):

UK Health and Safety Executive (HSE)

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:
No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State: Liquid

Colour: brown

Odour: Characteristic

Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 C): 0.86

Flash Point [Method]: >200C (392F) [ASTM D-92]

Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0

Autoignition Temperature: N/D

Boiling Point / Range: > 316C (600F)

Vapour Density (Air = 1): > 2 at 101 kPa

Vapour Pressure: < 0.013 kPa (0.1 mm Hg) at 20C

Evaporation Rate (N-Butyl Acetate = 1): N/D

pH: N/A

Log Pow (n-Octanol/Water Partition Coefficient): > 3.5

Solubility in Water: Negligible

Viscosity: 460 cSt (460 mm²/sec) at 40C | 30.6 cSt (30.6 mm²/sec) at 100C

Oxidising properties: See Sections 3, 15, 16.

Product Name: MOBILGEAR 634
Revision Date: 21Oct2008
Page 5 of 8

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -12°C (10°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt

SECTION 10	STABILITY AND REACTIVITY
------------	--------------------------

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidisers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11	TOXICOLOGICAL INFORMATION
------------	---------------------------

Acute Toxicity

Route of Exposure	Conclusion / Remarks
INHALATION	
Toxicity: LC50 > 5000 mg/m3	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: No end point data.	Negligible hazard at ambient/normal handling temperatures. Based on assessment of the components.
INGESTION	
Toxicity: LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity: LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: Data available.	Negligible irritation to skin at ambient temperatures. Based on test data for structurally similar materials.
Eye	
Irritation: Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.

CHRONIC/OTHER EFFECTS

For the product itself:

Repeated and/or prolonged exposure may cause irritation to the skin, eyes, or respiratory tract.

Contains:

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitising in test animals.

Product Name: MOBILGEAR 634
Revision Date: 21Oct2008
Page 6 of 8

Additional information is available by request.

SECTION 12	ECOLOGICAL INFORMATION
------------	------------------------

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:
Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13	DISPOSAL CONSIDERATIONS
------------	-------------------------

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

European Waste Code: 13 02 05

NOTE: These codes are assigned based upon the most common uses for this material and may not reflect contaminants resulting from actual use. Waste producers need to assess the actual process used when generating the waste and its contaminants in order to assign the proper waste disposal code(s).

This material is considered as hazardous waste pursuant to Directive 91/689/EEC on hazardous waste, and subject to the provisions of that Directive unless Article 1(5) of that Directive applies.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. **DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION.**

Product Name: MOBILGEAR 634
Revision Date: 21Oct2008
Page 7 of 8

THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (ADR/RID) : Not Regulated for Land Transport

INLAND WATERWAYS (ADNR) : Not Regulated for Inland Waterways Transport

SEA (IMDG) : Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA) : Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

Material is not dangerous as defined by the EU Dangerous Substances/Preparations Directives.

EU LABELING: Not regulated according to EC Directives

Contains: Alkyl Amine May produce an allergic reaction. This material contains one or more sensitizers <1.0% by weight which are not identified in the Composition Section.

REGULATORY STATUS AND APPLICABLE LAWS AND REGULATIONS

Complies with the following national/regional chemical inventory requirements: AICS, DSL, EINECS, TSCA

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

- Revision Changes:
- Section 06: Notification Procedures - Header was modified.
 - Section 13: Empty Container Warning was modified.
 - Section 09: Phys/Chem Properties Note was modified.
 - Section 09: Boiling Point °C(°F) was modified.
 - Section 08: Hand Protection was modified.
 - Section 08: Environmental Control - Note was modified.
 - Section 09: Vapour Pressure was modified.
 - Section 07: Handling and Storage - Storage Phrases was modified.
 - Section 05: Hazardous Combustion Products was modified.
 - Section 06: Accidental Release - Spill Management - Water was modified.

Product Name: MOBILGEAR 634
Revision Date: 21Oct2008
Page 8 of 8

- Section 09: Relative Density - Header was modified.
- Section 09: Flash Point °C(°F) was modified.
- Section 09: Viscosity was modified.
- Section 09: Viscosity was modified.
- Section 08: Environmental Control - Note was modified.
- Section 11: Skin Irritation Conclusion was modified.
- Section 16: Code to MHCs was modified.
- Section 15: Sensitiser Statement was modified.
- Section 11: Inhalation Irritation Test Data was modified.
- Section 11: Oral Lethality Test Data was modified.
- Section 11: Dermal Lethality Test Data was modified.
- Section 01: Company Contact Methods Sorted by Priority was modified.

%%revision_comment%%

The information and recommendations contained herein are, to the best of ExxonMobil's knowledge and belief, accurate and reliable as of the date issued. You can contact ExxonMobil to insure that this document is the most current available from ExxonMobil. The information and recommendations are offered for the user's consideration and examination. It is the user's responsibility to satisfy itself that the product is suitable for the intended use. If buyer repackages this product, it is the user's responsibility to insure proper health, safety and other necessary information is included with and/or on the container. Appropriate warnings and safe-handling procedures should be provided to handlers and users. Alteration of this document is strictly prohibited. Except to the extent required by law, re-publication or retransmission of this document, in whole or in part, is not permitted. The term, "ExxonMobil" is used for convenience, and may include any one or more of ExxonMobil Chemical Company, Exxon Mobil Corporation, or any affiliates in which they directly or indirectly hold any interest.

Internal Use Only
MHC: 0B, 0B, 0, 0, 0, 0 PPEC: A
DGN: 2009145XGB (549058)



481580-00 MOBIL 1 5W-50

MATERIAL SAFETY DATA BULLETIN

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: MOBIL 1 5W-50
SUPPLIER: EXXONMOBIL OIL CORPORATION
3225 GALLOWES RD.
FAIRFAX, VA 22037

24 - Hour Health and Safety Emergency (call collect): 609-737-4411

24 - Hour Transportation Emergency:
CHEMTREC: 800-424-9300 202-483-7616
LUBES AND FUELS: 281-834-3296

Product and Technical Information:
Lubricants and Specialties: 800-662-4525 800-443-9966
Fuels Products: 800-947-9147
MSDS Fax on Demand: 613-228-1467
MSDS Internet Website: <http://emmsds.ihssolutions.com/>

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAMES AND SYNONYMS: BASE OIL AND ADDITIVES

GLOBALLY REPORTABLE MSDS INGREDIENTS:

None.

OTHER INGREDIENTS:

Substance Name	Approx. Wt%
POLYALKYLENE SUCCINIC ACID,	1-5
POLYAMINE DERIVATIVE	
(147880-09-9)	

See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION

Under normal conditions of use, this product is not considered hazardous according to regulatory guidelines (See section 15).

EMERGENCY OVERVIEW: Brown Liquid. DOT ERG No. : NA

POTENTIAL HEALTH EFFECTS: Under normal conditions of intended use, this product does not pose a risk to health. Excessive exposure may result in eye, skin or respiratory irritation.

For further health effects/toxicological data, see Section 11.

4. FIRST AID MEASURES

EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.

SKIN CONTACT: Wash contact areas with soap and water. Remove and clean oil soaked clothing daily and wash affected area. (See Section 16 - Injection Injury)

INHALATION: Not expected to be a problem. However, if respiratory irritation, dizziness, nausea, or unconsciousness occurs due to excessive vapor or mist exposure, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or mouth-to-mouth resuscitation.
INGESTION: Not expected to be a problem. Seek medical attention if discomfort occurs. Do not induce vomiting.

5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical and water fog.
SPECIAL FIRE FIGHTING PROCEDURES: Water or foam may cause frothing. Use water to keep fire exposed containers cool. Water spray may be used to flush spills away from exposure. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.

SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS: None.

COMBUSTION PRODUCTS: Fumes, smoke, carbon monoxide, sulfur oxides, aldehydes and other decomposition products, in the case of incomplete combustion.

Flash Point C(F): > 200(392) (ASTM D-92).

Flammable Limits (approx.% vol.in air) - LEL: 0.9%, UEL: 7.0%

NFPA HAZARD ID: Health: 0, Flammability: 1, Reactivity: 0

6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills/releases as required to appropriate authorities. U.S. Coast Guard and EPA regulations require immediate reporting of spills/releases that could reach any waterway including intermittent dry creeks. Report spill/release to Coast Guard National Response Center toll free number (800)424-8802. In case of accident or road spill notify CHEMTREC (800) 424-9300.

PROCEDURES IF MATERIAL IS RELEASED OR SPILLED:

LAND SPILL: Shut off source taking normal safety precautions. Take measures to minimize the effects on ground water. Recover by pumping or contain spilled material with sand or other suitable absorbent and remove mechanically into containers. If necessary, dispose of adsorbed residues as directed in Section 13.

WATER SPILL: Confine the spill immediately with booms. Warn other ships in the vicinity. Notify port and other relevant authorities. Remove from the surface by skimming or with suitable absorbents. If permitted by regulatory authorities the use of suitable dispersants should be considered where recommended in local oil spill procedures.

ENVIRONMENTAL PRECAUTIONS: Prevent material from entering sewers, water sources or low lying areas; advise the relevant authorities if it has, or if it contaminates soil/vegetation.

PERSONAL PRECAUTIONS: See Section 8

7. HANDLING AND STORAGE

HANDLING: No special precautions are necessary beyond normal good hygiene practices. See Section 8 for additional personal protection advice when handling this product.

STORAGE: Keep containers closed when not in use. Do not store in open or unlabelled containers. Store away from strong oxidizing agents and combustible materials. Do not store near heat, sparks, flame or strong oxidants.

SPECIAL PRECAUTIONS: Prevent small spills and leakages to avoid slip hazard.

EMPTY CONTAINER WARNING: Empty containers retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove.

Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS:

When mists/aerosols can occur, the following are recommended: 5 mg/m3 (as oil mist)- ACGIH Threshold Limit Value (TLV), 10 mg/m3 (as oil mist) - ACGIH Short Term Exposure Limit (STEL), 5 mg/m3 (as oil mist) - OSHA Permissible Exposure Limit (PEL)

VENTILATION: If mists are generated, use adequate ventilation, local exhaust or enclosures to control below exposure limits.

RESPIRATORY PROTECTION: If mists are generated, and/or when ventilation is not adequate, wear approved respirator.

EYE PROTECTION: If eye contact is likely, safety glasses with side shields or chemical type goggles should be worn.

SKIN PROTECTION: Not normally required. When splashing or liquid

contact can occur frequently, wear oil resistant gloves and/or other protective clothing. Good personal hygiene practices should always be followed.

9. PHYSICAL AND CHEMICAL PROPERTIES

Typical physical properties are given below. Consult Product Data Sheet for specific details.

APPEARANCE: Liquid

COLOR: Brown

ODOR: Mild

ODOR THRESHOLD-ppm: NE

pH: NA

BOILING POINT C(F): > 316(600)

MELTING POINT C(F): NA

FLASH POINT C(F): > 200(392) (ASTM D-92)

FLAMMABILITY (solids): NE

AUTO FLAMMABILITY C(F): NA

EXPLOSIVE PROPERTIES: NA

OXIDIZING PROPERTIES: NA

VAPOR PRESSURE-mmHg 20 C: < 0.1

VAPOR DENSITY: > 2.0

EVAPORATION RATE: NE

RELATIVE DENSITY, 15/4 C: 0.859

SOLUBILITY IN WATER: Negligible

PARTITION COEFFICIENT: > 3.5

VISCOSITY AT 40 C, cst: 104.9

VISCOSITY AT 100 C, cst: 17.5

POUR POINT C(F): -54(-65)

FREEZING POINT C(F): NE

VOLATILE ORGANIC COMPOUND: NE

DMSO EXTRACT, IP-346 (WT.%): <3, for mineral oil only

NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES

FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Stable.

CONDITIONS TO AVOID: Extreme heat and high energy sources of ignition.

INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS: Product does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL DATA

---ACUTE TOXICOLOGY---

ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.

DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the

components.

INHALATION TOXICITY (RATS): Practically non-toxic (LC50: greater than 5 mg/l). ---Based on testing of similar products and/or the components.

EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score: greater than 6 but 15 or less). ---Based on testing of similar products and/or the components.

SKIN IRRITATION (RABBITS): Practically non-irritating. (Primary Irritation Index: greater than 0.5 but less than 3). ---Based on testing of similar products and/or the components.

OTHER ACUTE TOXICITY DATA: Although an acute inhalation study was not performed with this product, a variety of mineral and synthetic oils, such as those in this product, have been tested. These samples had virtually no effect other than a nonspecific inflammatory response in the lung to the aerosolized mineral oil.

The presence of additives in other tested formulations (in approximately the same amounts as in the present formulation) did not alter the observed effects.

---SUBCHRONIC TOXICOLOGY (SUMMARY)---

No significant adverse effects were found in studies using repeated dermal applications of similar formulations to the skin of laboratory animals for 13 weeks at doses significantly higher than those expected during normal industrial exposure. The animals were evaluated extensively for effects of exposure (hematology, serum chemistry, urinalysis, organ weights, microscopic examination of tissues etc.).

---REPRODUCTIVE TOXICOLOGY (SUMMARY)---

No teratogenic effects would be expected from dermal exposure, based on laboratory developmental toxicity studies of major components in this formulation and/or materials of similar composition.

---CHRONIC TOXICOLOGY (SUMMARY)---

Repeated and/or prolonged exposure may cause irritation to the skin, eyes or respiratory tract. Overexposure to oil mist may result in oil droplet deposition and/or granuloma formation. For mineral base oils: Base oils in this product are severely solvent refined and/or severely hydrotreated. Chronic mouse skin painting studies of severely treated oils showed no evidence of carcinogenic effects. These results are confirmed on a continuing basis using various screening methods such as Modified Ames Test, IP-346, and/or other analytical methods. For synthetic base oils: The base oils in this product have been tested in the Ames assay and other tests of mutagenicity with negative results. These base oils are not expected to be carcinogenic with chronic dermal exposures.

---SENSITIZATION (SUMMARY)---

Not expected to be sensitizing based on tests of this product, components, or similar products.

---OTHER TOXICOLOGY DATA---

Used gasoline engine oils have shown evidence of skin carcinogenic activity in laboratory tests when no effort was made to wash the oil off between applications. Used oil from diesel engines did not produce this effect.

----- ECOLOGICAL INFORMATION -----

ENVIRONMENTAL FATE AND EFFECTS:

In the absence of specific environmental data for this product, this assessment is based on information for representative products.

ECOTOXICITY: Available ecotoxicity data (LL50 >1000 mg/L) indicates that adverse effects to aquatic organisms are not expected from this product.

MOBILITY: When released into the environment, adsorption to sediment and soil will be the predominant behavior.

PERSISTENCE AND DEGRADABILITY: This product is expected to be inherently biodegradable.

BIOACCUMULATIVE POTENTIAL: Bioaccumulation is unlikely due to the very low water solubility of this product, therefore bioavailability to aquatic organisms is minimal.

----- DISPOSAL CONSIDERATIONS -----

WASTE DISPOSAL: Product is suitable for burning in an enclosed, controlled burner for fuel value. Such burning may be limited pursuant to the Resource Conservation and Recovery Act. In addition, the product is suitable for processing by an approved recycling facility or can be disposed of at an appropriate government waste disposal facility. Use of these methods is subject to user compliance with applicable laws and regulations and consideration of product characteristics at time of disposal.

RCRA INFORMATION: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity, or reactivity. The unused product is not formulated with substances covered by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

----- TRANSPORT INFORMATION -----

USA DOT: NOT REGULATED BY USA DOT.

RID/ADR: NOT REGULATED BY RID/ADR.

IMO: NOT REGULATED BY IMO.

IATA: NOT REGULATED BY IATA.

Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user and WE EXPRESSLY DISCLAIM ALL WARRANTIES OF EVERY KIND AND NATURE, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE IN RESPECT TO THE USE OR SUITABILITY OF THE PRODUCT. Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users. Alteration of this document is strictly prohibited. Except to the extent required by law, republication or retransmission of this document, in whole or in part, is not permitted. Exxon Mobil Corporation and its affiliated companies assume no responsibility for accuracy of information unless the document is the most current available from an official ExxonMobil distribution system. Exxon Mobil Corporation and its affiliated companies neither represent nor warrant that the format, content or product formulas contained in this document comply with the laws of any other country except the United States of America.

Prepared by: ExxonMobil Oil Corporation
Environmental Health and Safety Department, Clinton, USA

Product Name: MOBILARMA MT
Revision Date: 14Dec2006
Page 1 of 9

SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

As of the revision date above, this (M)SDS meets the regulations in the United Kingdom & Ireland.

PRODUCT

Product Name: MOBILARMA MT
Product Description: Hydrocarbons and Additives
Product Code: 201570401070, 403009, 671131-60
Intended Use: Corrosion inhibitor

COMPANY IDENTIFICATION

Supplier: EXXONMOBIL LUBRICANTS & SPECIALTIES EUROPE, A DIVISION OF EXXONMOBIL PETROLEUM & CHEMICAL, BVBA (EMPC)
POLDEROIJKVEG
B-2030 Antwerpen
Belgium

24 Hour Environmental / Health Emergency Telephone (UK) 01372 222 000 / (IRELAND) 44 1372 222 000

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

This material is regulated as a preparation.

Reportable Hazardous Substance(s) or Complex Substance(s)

Name	CAS#	EINECS / ELINCS	Concentration*	Symbols/Risk Phrases
BENZENESULFONIC ACID, MONO C16-24-ALKYL DERIVS, CALCIUM SALTS	70024-69-0	274-263-7	0.1 - 1%	Xn/R43, R63
HYDROTREATED HEAVY NAPHTHA	64742-48-9	265-150-3	80 - 90%	Xn/R65, R66
Naphthalenesulphonic acid, dinonyl-, calcium salt	57855-77-3	260-991-2	0.1 - 1%	Xi/R36/38, Xi/R43, R53
Paraffin Wax	8002-74-2	232-315-6	5 - 10%	None

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

SECTION 3 HAZARDS IDENTIFICATION

This material is dangerous according to regulatory guidelines (see (M)SDS Section 15).

CLASSIFICATION: | Xn; R65 | R66 |

PHYSICAL / CHEMICAL HAZARDS

Material can release vapours that readily form flammable mixtures. Vapour accumulation could flash and/or explode if ignited. Material can accumulate static charges which may cause an incendiary electrical discharge.

HEALTH HAZARDS

Harmful: may cause lung damage if swallowed. Repeated exposure may cause skin dryness or cracking. This product may be used in certain applications where misting can occur. Excessive exposure to liquids and mists may cause skin and eye irritation. In addition, excessive exposure to mists may cause respiratory irritation and damage and aggravate pre-existing emphysema or asthma. High-pressure injection under skin may cause

Product Name: MOBILARMA MT
Revision Date: 14Dec2006
Page 2 of 9

serious damage.

Note: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

Seek immediate medical attention. Do not induce vomiting.

NOTE TO PHYSICIAN

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Combustible. Pressurised mists may form a flammable mixture. Hazardous material. Firefighters should consider protective equipment indicated in Section 8.

Hazardous Combustion Products: Oxides of carbon, Smoke, Fume, Sulphur Oxides, Aldehydes, Incomplete

Product Name: MOBILARMA MT
Revision Date: 14Dec2006
Page 3 of 9

combustion products

FLAMMABILITY PROPERTIES

Flash Point [Method]: 62°C (144°F) [ASTM D-93]
Flammable Limits (Approximate volume % in air): LEL: 0.6 UEL: 7.0
Autoignition Temperature: >200°C (392°F)

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if you can do so without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapour-suppressing foam may be used to reduce vapour. Use clean non-sparking tools to collect absorbed material.

Large Spills: Water spray may reduce vapour, but may not prevent ignition in enclosed spaces. Small Spills: Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Recover by pumping or with suitable absorbent.

SPILL MANAGEMENT

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do so without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapour-suppressing foam may be used to reduce vapour. Use clean non-sparking tools to collect absorbed material.

Large Spills: Water spray may reduce vapour, but may not prevent ignition in enclosed spaces. Small Spills: Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do so without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid contact with skin. Use only with adequate ventilation. Use proper bonding and/or earthing procedures. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source).

Static Accumulator: This material is a static accumulator.

STORAGE

Product Name: MOBILARMA MT
Revision Date: 14Dec2006
Page 4 of 9

Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Storage containers should be earthed and bonded. Drums must be earthed and bonded and equipped with self-closing valves, pressure vacuum bungs and flame arresters.

Suitable Materials and Coatings: Carbon steel; Stainless steel; Polyethylene; Polypropylene; Polyester;

Teflon

Unsuitable Materials and Coatings: Natural rubber; Butyl rubber; Ethylene-propylene-diene monomer (EPDM); Polystyrene

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit/Standard	Note	Source	Year
Paraffin Wax	Fume.	STEL 6 mg/m ³		UK EH40	2005
Paraffin Wax	Fume.	TWA 2 mg/m ³		UK EH40	2005
Paraffin Wax	Fume.	TWA 2 mg/m ³		ACGIH	2006

Exposure limits/standards for materials that can be formed when handling this product: When mists / aerosols can occur, the following are recommended: 5 mg/m³ - ACGIH TLV, 10 mg/m³ - ACGIH STEL.

Information about recommended monitoring procedures can be obtained from the following agency(ies)/institute(s):
France L'Institut National de Recherche et de Sécurité (INRS) Germany Berufsgenossenschaftliches Institut für Arbeitssicherheit (BIA) UK Health and Safety Executive (HSE)

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Use explosion-proof ventilation equipment to stay below exposure limits.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Particulate air-purifying respirator approved for dust or oil mist is recommended. European Committee for Standardization (CEN) standards EN 136, 140 and 405 provide respirator masks and EN 149 and 143 provide filter recommendations.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Work conditions can greatly effect glove durability; inspect and replace worn or damaged

Product Name: MOBILARMA MT
Revision Date: 14Dec2006
Page 5 of 9

gloves. The types of gloves to be considered for this material include:

Chemical resistant gloves are recommended. If contact with forearm is likely wear gauntlet style gloves. Nitrile, CEN standards EN 420 and EN 374 provide general requirements and lists of glove types.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:
Chemical/oil resistant clothing is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State: Liquid
Colour: brown
Odour: Characteristic
Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.813
Flash Point [Method]: 62°C (144°F) [ASTM D-93]
Flammable Limits (Approximate volume % in air): LEL: 0.6 UEL: 7.0
Autoignition Temperature: >200°C (392°F)
Boiling Point / Range: - 217°C (423°F)
Vapour Density (Air = 1): > 1 at 101 kPa
Vapour Pressure: 0.05 kPa (0.38 mm Hg) at 20°C
Evaporation Rate (N-Butyl Acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): N/D
Solubility in Water: Negligible
Viscosity: 1.78 cSt (1.78 mm²/sec) at 40°C
Oxidising properties: See Sections 3, 15, 16.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
DMSO Extract (mineral oil only), IP-346: < 3 %wt

SECTION 10 STABILITY AND REACTIVITY

Product Name: MOBILARMA MT
Revision Date: 14Dec2006
Page 6 of 9

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Open flames and high energy ignition sources.

MATERIALS TO AVOID: Strong oxidisers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

Acute Toxicity

Route of Exposure	Conclusion / Remarks
INHALATION	
Toxicity: No end point data.	Not determined.
Irritation: No end point data.	Elevated temperatures or mechanical action may form vapours, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs. Based on assessment of the components.
INGESTION	
Toxicity: No end point data.	Minimally Toxic. Based on assessment of the components.
Skin	
Toxicity: No end point data.	Minimally Toxic. Based on assessment of the components.
Irritation: No end point data.	May dry the skin leading to discomfort and dermatitis. Irritating to the skin. Based on assessment of the components.
Eye	
Irritation: No end point data.	May cause mild, short-lasting discomfort to eyes. Based on assessment of the components.

CHRONIC/OTHER EFFECTS

For the product itself:

Vapour concentrations above recommended exposure levels are irritating to the eyes and the respiratory tract, may cause headaches and dizziness, are anaesthetic and may have other central nervous system effects. Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema.

Contains:

Petroleum wax: Not carcinogenic in animal tests. Not carcinogenic in lifetime animal skin painting tests and oral feeding tests. Did not cause mutations in-vitro. High oral doses in certain strains of rats (F-344) resulted in microscopic inflammatory (microgranuloma) changes in the liver, spleen, and lymph nodes. These animals also had some increased organ weights and inflammation of the cardiac mitral valve, and accumulation of saturated mineral hydrocarbons in certain tissues. Non-sensitizing in animal tests and human subjects.

Additional information is available by request.

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Product Name: MOBILARMA MT
Revision Date: 14Dec2006
Page 7 of 9

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

More volatile component -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.
Less volatile component -- Low solubility and floats and is expected to migrate from water to the land.
Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Majority of components -- Expected to be readily biodegradable.

Atmospheric Oxidation:

More volatile component -- Expected to degrade rapidly in air

BIOACCUMULATION POTENTIAL

Hydrocarbon component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

OTHER ECOLOGICAL INFORMATION

VOC: 84 %wt

SECTION 13

DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

REGULATORY DISPOSAL INFORMATION

European Waste Code: 07 07 04

NOTE: These codes are assigned based upon the most common uses for this material and may not reflect contaminants resulting from actual use. Waste producers need to assess the actual process used when generating the waste and its contaminants in order to assign the proper waste disposal code(s).

This material is considered as hazardous waste pursuant to Directive 91/689/EEC on hazardous waste, and subject to the provisions of that Directive unless Article 1(5) of that Directive applies.

Empty Container Warning (where applicable): Empty containers may retain residue and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE; SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

SECTION 14

TRANSPORT INFORMATION

LAND (ADR/RID) : Not Regulated for Land Transport

Product Name: MOBILARMA MT
Revision Date: 14Dec2006
Page 8 of 9

INLAND WATERWAYS (ADNR)

Proper Shipping Name: SUBSTANCES WITH 61°C < f.p.<= 100 °C, (N.O.S.) (ISO AND N-DECANE)

Hazard Class: 9

UN or ID Number: 9003

Packing Group: (N/A)

Label(s) / Mark(s): None

Transport Document Name: 9003, SUBSTANCES WITH 61°C < f.p.<= 100 °C, (N.O.S.) (ISO AND N-DECANE), 9

SEA (IMDG) : Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA) : Not Regulated for Air Transport

SECTION 15

REGULATORY INFORMATION

Material is dangerous as defined by the EU Dangerous Substances/Preparations Directives.

CLASSIFICATION: Harmful.

EU LABELING:

Symbol: Xn



Harmful.

Nature of Special Risk: R65; Harmful: may cause lung damage if swallowed. R66; Repeated exposure may cause skin dryness or cracking.

Safety Advice: S23; Do not breathe gas/fumes/vapour/spray S24; Avoid contact with skin. S62; If swallowed, do not induce vomiting; seek medical advice immediately and show this container or label.

Contains: HYDROTREATED HEAVY NAPHTHA

Contains: CALCIUM SULPHONATE, May produce an allergic reaction.

REGULATORY STATUS AND APPLICABLE LAWS AND REGULATIONS

Complies with the following national/regional chemical inventory requirements: AICS, IECSC, DSL, EINECS, ENCS, KECI, PICCS, TSCA

SECTION 16

OTHER INFORMATION



Product Name: MOBILARMA MT
Revision Date: 14Dec2006
Page 9 of 9

N/D = Not determined, N/A = Not applicable
KEY TO THE RISK CODES CONTAINED IN SECTION 2 AND 3 OF THIS DOCUMENT (for information only):
R36; Irritating to eyes.
R38; Irritating to skin.
R43; May cause sensitisation by skin contact.
R53; May cause long-term adverse effects in the aquatic environment.
R65; Harmful: may cause lung damage if swallowed.
R66; Repeated exposure may cause skin dryness or cracking.

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

- Revision Changes:
- Section 12: Ecological Information - Mobility was modified.
 - Section 12: Ecological Information - Bioaccumulation was modified.
 - Section 12: Ecological Information - Mobility was added.
 - Section 12: Ecological Information - Mobility was added.
 - Section 12: Ecological Information - Acute Aquatic Toxicity was added.
 - Section 12: Ecological Information - Biodegradation was added.
 - Section 12: Ecological Information - Acute Aquatic Toxicity was added.
 - Section 12: Ecological Information - Biodegradation was added.
 - Section 12: Ecological Information - Acute Aquatic Toxicity was deleted.
 - Section 12: Ecological Information - Biodegradation was deleted.
 - Section 12: Ecological Information - Acute Aquatic Toxicity was deleted.
 - Section 12: Ecological Information - Biodegradation was deleted.

The information and recommendations contained herein are, to the best of ExxonMobil's knowledge and belief, accurate and reliable as of the date issued. You can contact ExxonMobil to insure that this document is the most current and available from ExxonMobil. The information and recommendations are offered for the user's consideration and examination. It is the user's responsibility to satisfy itself that the product is suitable for the intended use. If buyer repackages this product, it is the user's responsibility to insure proper health, safety and other necessary information is included with and/or on the container. Appropriate warnings and safe-handling procedures should be provided to handlers and users. Alteration of this document is strictly prohibited. Except to the extent required by law, re-publication or retransmission of this document, in whole or in part, is not permitted. The term, "ExxonMobil" is used for convenience, and may include any one or more of ExxonMobil Chemical Company, Exxon Mobil Corporation, or any affiliates in which they directly or indirectly hold any interest.

Internal Use Only
MHC: 1A, 0, 0, 1, 1 PPEC: D

DGN: 2010845XGB (555518)

Product Name: MOBILGREASE XHP 103
Revision Date: 31Oct2008
Page 1 of 8

SAFETY DATA SHEET

SECTION 1	PRODUCT AND COMPANY IDENTIFICATION
-----------	------------------------------------

As of the revision date above, this (M)SDS meets the regulations in the United Kingdom & Ireland.

PRODUCT

Product Name: MOBILGREASE XHP 103
Product Description: Base Oil and Additives
Product Code: 2015A0202510, 406064, 642447-60
Intended Use: Grease

COMPANY IDENTIFICATION

Supplier: EXXONMOBIL LUBRICANTS & SPECIALTIES EUROPE, A DIVISION OF EXXONMOBIL
PETROLEUM & CHEMICAL, BVBA (EMPC)
POLDERDIJKWEG
B-2030 Antwerpen
Belgium

24 Hour Environmental / Health Emergency (UK) 01372 222 000 / (IRELAND) 44 1372 222 000
Telephone
e-mail SDS-UK@EXXONMOBIL.COM

SECTION 2	HAZARDS IDENTIFICATION
-----------	------------------------

This material is not considered to be hazardous according to regulatory guidelines see Section 15.

HEALTH HAZARDS

Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

Note: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3	COMPOSITION / INFORMATION ON INGREDIENTS
-----------	--

Reportable Hazardous Substance(s) or Complex Substance(s) Name	CAS#	EINECS / ELINCS	Concentration *	Symbols/Risk Phrases
Benzenamine, N-phenyl-, reaction products with 2,4,4-trimethylpentene	68411-46-1	270-128-1	1 - 5%	R52/53
ZINC DIALKYL DITHIOPHOSPHATE	68457-79-4	270-608-0	< 2.5%	Xi;R38, Xi;R41, N;R51/53

Product Name: MOBILGREASE XHP 103
Revision Date: 31Oct2008
Page 2 of 8

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

SECTION 4	FIRST AID MEASURES
-----------	--------------------

INHALATION

Under normal conditions of intended use, this material is not expected to be an inhalation hazard.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5	FIRE FIGHTING MEASURES
-----------	------------------------

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Smoke, Fume, Aldehydes, Sulphur Oxides, Incomplete combustion products, Oxides of carbon

FLAMMABILITY PROPERTIES

Flash Point [Method]: >204C (400F) [EST. FOR OIL, ASTM D-92 (COC)]
Flammable Limits (Approximate volume % in air): LEL: N/D UEL: N/D
Autoignition Temperature: N/D

SECTION 6	ACCIDENTAL RELEASE MEASURES
-----------	-----------------------------

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable

Product Name: MOBILGREASE XHP 103
Revision Date: 31Oct2008
Page 3 of 8

regulations.

SPILL MANAGEMENT

- Land Spill: Allow spilled material to solidify and shovel it up into a suitable container for recycle or disposal. Scrape up spilled material with shovels into a suitable container for recycle or disposal.
- Water Spill: Stop leak if you can do so without risk. Confine the spill immediately with booms. Warn other shipping. Skim from surface
- Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

- Prevent small spills and leakage to avoid slip hazard.
- Static Accumulator: This material is not a static accumulator.

STORAGE

Do not store in open or unlabelled containers.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Note: Information about recommended monitoring procedures can be obtained from the relevant agency(ies)/institute(s):

UK Health and Safety Executive (HSE)

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator

Product Name: MOBILGREASE XHP 103
Revision Date: 31Oct2008
Page 4 of 8

selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No protection is ordinarily required under normal conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State: Solid

Form: semi-fluid

Colour: dark blue

Odour: Characteristic

Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 C): 0.9

Flash Point [Method]: >204C (400F) [EST. FOR OIL, ASTM D-92 (COC)]

Flammable Limits (Approximate volume % in air): LEL: N/D UEL: N/D

Autoignition Temperature: N/D

Boiling Point / Range: > 316C (600F)

Vapour Density (Air = 1): N/D

Vapour Pressure: < 0.013 kPa (0.1 mm Hg) at 20°C

Evaporation Rate (N-Butyl Acetate = 1): N/D

Product Name: MOBILGREASE XHP 103
Revision Date: 31Oct2008
Page 5 of 8

pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: 100 cSt (100 mm²/sec) at 40°C
Oxidising properties: See Sections 3, 15, 16.

OTHER INFORMATION
Freezing Point: N/D
Melting Point: N/D
DMSO Extract (mineral oil only), IP-346: < 3 %wt

Note: Most physical properties above are for the oil component in the material.

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidisers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

Acute Toxicity

Route of Exposure	Conclusion / Remarks
INHALATION	Toxicity: No end point data.
	Irritation: No end point data.
INGESTION	Toxicity: LD50 > 5000 mg/kg
Skin	Toxicity: LD50 > 5000 mg/kg
Irritation: Data available.	
Eye	Irritation: Data available.

CHRONIC/OTHER EFFECTS

Contains:
Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346. Modified

Product Name: MOBILGREASE XHP 103
Revision Date: 31Oct2008
Page 6 of 8

Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitising in test animals.

Additional information is available by request.

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY
Material -- Not expected to be harmful to aquatic organisms.

MOBILITY
Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY
Biodegradation:
Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL
Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

European Waste Code: 12 01 12

NOTE: These codes are assigned based upon the most common uses for this material and may not reflect contaminants resulting from actual use. Waste producers need to assess the actual process used when generating the waste and its contaminants in order to assign the proper waste disposal code(s).

This material is considered as hazardous waste pursuant to Directive 91/689/EEC on hazardous waste, and subject to the provisions of that Directive unless Article 1(5) of that Directive applies.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be

Product Name: MOBILGREASE XHP 103
Revision Date: 31Oct2008
Page 7 of 8

completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (ADR/RID) : Not Regulated for Land Transport

INLAND WATERWAYS (ADNR) : Not Regulated for Inland Waterways Transport

SEA (IMDG) : Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA) : Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

Material is not dangerous as defined by the EU Dangerous Substances/Preparations Directives.

EU LABELING: Not regulated according to EC Directives

REGULATORY STATUS AND APPLICABLE LAWS AND REGULATIONS

Complies with the following national/regional chemical inventory requirements: AICS, EINECS, ENCS, TSCA

Special Cases:

Inventory	Status
NDSL	Restrictions Apply

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable
KEY TO THE RISK CODES CONTAINED IN SECTION 2 AND 3 OF THIS DOCUMENT (for information only):
R38: Irritating to skin.
R41: Risk of serious damage to eyes.
R51/53: Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R52/53: Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Revision Changes:
Section 06: Notification Procedures - Header was modified.
Section 13: Empty Container Warning was modified.

Product Name: MOBILGREASE XHP 103
Revision Date: 31Oct2008
Page 8 of 8

Section 08: Hand Protection was modified.
Section 08: Environmental Control - Note was modified.
Section 05: Hazardous Combustion Products was modified.
Section 08: Environmental Control - Note was modified.
Section 16: Code to MHCs was modified.
Section 11: Inhalation Lethality Test Data was modified.
Section 11: Oral Lethality Test Data was modified.
Section 11: Dermal Lethality Test Data was modified.
Section 01: Company Contact Methods Sorted by Priority was modified.

%%revision_comment%%

The information and recommendations contained herein are, to the best of ExxonMobil's knowledge and belief, accurate and reliable as of the date issued. You can contact ExxonMobil to insure that this document is the most current and available from ExxonMobil. The information and recommendations are offered for the user's consideration and examination. It is the user's responsibility to satisfy itself that the product is suitable for the intended use. If buyer repackages this product, it is the user's responsibility to insure proper health, safety and other necessary information is included with and/or on the container. Appropriate warnings and safe-handling procedures should be provided to handlers and users. Alteration of this document is strictly prohibited. Except to the extent required by law, re-publication or retransmission of this document, in whole or in part, is not permitted. The term, "ExxonMobil" is used for convenience, and may include any one or more of ExxonMobil Chemical Company, Exxon Mobil Corporation, or any affiliates in which they directly or indirectly hold any interest.

Internal Use Only

MHC: 0B, 0B, 0, 0, 0, 0

PPEC: A

DGN: 2009959XGB (1011540)



603191-00 MOBIL ALMO 527

MATERIAL SAFETY DATA BULLETIN

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: MOBIL ALMO 527
SUPPLIER: EXXONMOBIL OIL CORPORATION
3225 GALLOWS RD.
FAIRFAX, VA 22037

24 - Hour Health and Safety Emergency (call collect): 609-737-4411

24 - Hour Transportation Emergency:
CHEMTREC: 800-424-9300 202-483-7616
LUBES AND FUELS: 281-834-3296

Product and Technical Information:
Lubricants and Specialties: 800-662-4525 800-443-9966
Fuels Products: 800-947-9147
MSDS Fax on Demand: 613-228-1467
MSDS Internet Website: <http://emmsds.ihssolutions.com/>

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAMES AND SYNONYMS: PET. HYDROCARBONS AND ADDITIVES

GLOBALLY REPORTABLE MSDS INGREDIENTS:

None.

See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION

This product may be considered hazardous according to regulatory guidelines (See Section 15).

EMERGENCY OVERVIEW: Dark Amber Liquid. DOT ERG No. : NA

POTENTIAL HEALTH EFFECTS: This product may be used in certain applications where misting can occur. Exposure to oil mist may result in eye and skin irritation. Excessive exposure to mists

may cause respiratory irritation or damage.

For further health effects/toxicological data, see Section 11.

4. FIRST AID MEASURES

EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.

SKIN CONTACT: Wash contact areas with soap and water. Remove and clean oil soaked clothing daily and wash affected area. (See Section 16 - Injection Injury)

INHALATION: If respiratory irritation, dizziness, nausea, or unconsciousness occurs due to excessive vapor or mist exposure, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or mouth-to-mouth resuscitation.

INGESTION: Not expected to be a problem. Seek medical attention if discomfort occurs. Do not induce vomiting.

NOTE TO PHYSICIANS: Pre-existing conditions which may be aggravated by exposure include emphysema and asthma.

5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical and water fog.

SPECIAL FIRE FIGHTING PROCEDURES: Water or foam may cause frothing. Use water to keep fire exposed containers cool. Water spray may be used to flush spills away from exposure. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.

SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS: None.

COMBUSTION PRODUCTS: Fumes, smoke, carbon monoxide, sulfur oxides, metal oxides, aldehydes and other decomposition products, in the case of incomplete combustion.

Flash Point C(F): > 198(388) (ASTM D-93).

Flammable Limits (approx.% vol.in air) - LEL: 0.9%, UEL: 7.0%

NFPA HAZARD ID: Health: 0, Flammability: 1, Reactivity: 0

6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills/releases as required to appropriate authorities. U.S. Coast Guard and EPA regulations require immediate reporting of spills/releases that could reach any waterway including intermittent dry creeks. Report spill/release to Coast Guard National Response Center toll free number (800)424-8802. In case of accident or road spill notify CHEMTREC (800) 424-9300.

PROCEDURES IF MATERIAL IS RELEASED OR SPILLED:

LAND SPILL: Shut off source taking normal safety precautions. Take measures to minimize the effects on ground water. Recover by pumping or contain spilled material with sand or other suitable absorbent and remove mechanically into containers. If necessary, dispose of adsorbed residues as directed in Section 13.

WATER SPILL: Confine the spill immediately with booms. Warn other ships in the vicinity. Notify port and other relevant authorities. Remove from the surface by skimming or with suitable absorbents. If permitted by regulatory authorities the use of suitable dispersants should be considered where recommended in local oil spill procedures.

ENVIRONMENTAL PRECAUTIONS: Prevent material from entering sewers, water sources or low lying areas; advise the relevant authorities if it has, or if it contaminates soil/vegetation.

PERSONAL PRECAUTIONS: See Section 8

7. HANDLING AND STORAGE

HANDLING: Avoid inhalation of vapors or mists. See Section 8 for additional personal protection advice when handling this product.

STORAGE: Keep containers closed when not in use. Do not store in open or unlabelled containers. Store away from strong oxidizing agents and combustible materials. Do not store near heat, sparks, flame or strong oxidants.

SPECIAL PRECAUTIONS: Prevent small spills and leakages to avoid slip hazard.

EMPTY CONTAINER WARNING: Empty containers retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS:

When mists/aerosols can occur, the following are recommended: 5 mg/m3 (as oil mist)- ACGIH Threshold Limit Value (TLV), 10 mg/m3 (as oil mist) - ACGIH Short Term Exposure Limit (STEL), 5 mg/m3 (as oil mist) - OSHA Permissible Exposure Limit (PEL)

VENTILATION: Use adequate ventilation, local exhaust, or enclosures to control below exposure limits.

RESPIRATORY PROTECTION: When ventilation is not adequate, wear approved respirator.

EYE PROTECTION: Chemical type goggles should be worn during misting operations. Normal industrial eye protection practices should be employed for other use conditions.

SKIN PROTECTION: Not normally required. When splashing or liquid contact can occur frequently, wear oil resistant gloves and/or other protective clothing. Good personal hygiene practices should always be followed.

9. PHYSICAL AND CHEMICAL PROPERTIES

Typical physical properties are given below. Consult Product Data Sheet for specific details.

APPEARANCE: Liquid
COLOR: Dark Amber
ODOR: Mild
ODOR THRESHOLD-ppm: NE
PH: NA
BOILING POINT C(F): > 316(600)
MELTING POINT C(F): NA
FLASH POINT C(F): > 198(388) (ASTM D-93)
FLAMMABILITY (solids): NE
AUTO FLAMMABILITY C(F): NA
EXPLOSIVE PROPERTIES: NA
OXIDIZING PROPERTIES: NA
VAPOR PRESSURE-mmHg 20 C: < 0.1
VAPOR DENSITY: > 2.0
EVAPORATION RATE: NE
RELATIVE DENSITY, 15/4 C: 0.893
SOLUBILITY IN WATER: Negligible
PARTITION COEFFICIENT: NE
VISCOSITY AT 40 C, cst: 112.9
VISCOSITY AT 100 C, cst: 11.4
POUR POINT C(F): < -30(-22)
FREEZING POINT C(F): NE
VOLATILE ORGANIC COMPOUND: NE
DMSO EXTRACT, IP-346 (WT.%): <3, for mineral oil only
NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES

FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Stable.
CONDITIONS TO AVOID: Extreme heat and high energy sources of ignition. INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: Product does not decompose at ambient temperatures.
HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL DATA

---ACUTE TOXICOLOGY---
ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
INHALATION TOXICITY (RATS): Practically non-toxic (LC50: greater than 5 mg/l). ---Based on testing of similar products and/or the components.
EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score:

greater than 6 but 15 or less). ---Based on testing of similar products and/or the components.
SKIN IRRITATION (RABBITS): Practically non-irritating. (Primary Irritation Index: greater than 0.5 but less than 3). ---Based on testing of similar products and/or the components.
OTHER ACUTE TOXICITY DATA: Although an acute inhalation study was not performed with this product, a variety of mineral oils, such as those in this product, have been tested. These samples had virtually no effect other than a nonspecific inflammatory response in the lung to the aerosolized mineral oil. The presence of additives in other tested formulations (in approximately the same amounts as in the present formulation) did not alter the observed effects.

---SUBCHRONIC TOXICOLOGY (SUMMARY)---
Severely solvent refined and severely hydrotreated mineral base oils have been tested at ExxonMobil by dermal application to rats 5/days/week for 90 days at doses significantly higher than those expected during normal industrial exposure. Extensive evaluations including microscopic examination of internal organs and clinical chemistry of body fluids, showed no adverse effects.

---CHRONIC TOXICOLOGY (SUMMARY)---
Repeated and/or prolonged exposure may cause irritation to the skin, eyes or respiratory tract. Overexposure to oil mist may result in oil droplet deposition and/or granuloma formation. The base oils in this product are severely solvent refined and/or severely hydrotreated. Chronic mouse skin painting studies of severely treated oils showed no evidence of carcinogenic effects. These results are confirmed on a continuing basis using various screening methods such as the Modified Ames Test, IP-346, and/or other analytical methods.

---SENSITIZATION (SUMMARY)---
Not expected to be sensitizing based on tests of this product, components, or similar products.

---OTHER TOXICOLOGY DATA---
Small metal particles from machining may cause abrasion of the skin and may predispose to dermatitis.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE AND EFFECTS:

ECOTOXICITY: Not established.

MOBILITY: Not established.

PERSISTENCE AND DEGRADABILITY: Not established.

BIOACCUMULATIVE POTENTIAL: Not established.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Product is suitable for burning in an enclosed, controlled burner for fuel value. Such burning may be limited pursuant to the Resource Conservation and Recovery Act. In addition, the product is suitable for processing by an approved recycling facility or can be disposed of at an appropriate government waste disposal facility. Use of these methods is subject to user compliance with applicable laws and regulations and consideration of product characteristics at time of disposal.

RCRA INFORMATION: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity, or reactivity. The unused product is not formulated with substances covered by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

14. TRANSPORT INFORMATION

USA DOT: NOT REGULATED BY USA DOT.

RID/ADR: NOT REGULATED BY RID/ADR.

IMO: NOT REGULATED BY IMO.

IATA: NOT REGULATED BY IATA.

STATIC ACCUMULATOR (50 picosiemens or less): YES

15. REGULATORY INFORMATION

US OSHA HAZARD COMMUNICATION STANDARD: This product may be used in certain applications where misting can occur. According to OSHA 29 CFR 1910.1200, certain mineral oil mists may be considered hazardous if the workplace airborne concentration exceeds 5 mg/m3 (ACGIH TLV).

EU Labeling: Product is not dangerous as defined by the European Union Dangerous Substances/Preparations Directives. EU labeling not required.

Governmental Inventory Status: All components comply with TSCA, EINECS/ELINCS, METI, and DSL.

U.S. Superfund Amendments and Reauthorization Act (SARA) Title III: This product contains no "EXTREMELY HAZARDOUS SUBSTANCES".

SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.

This product contains no chemicals subject to the supplier notification requirements of SARA (313) toxic release program.

The following product ingredients are cited on the lists below:
CHEMICAL NAME CAS NUMBER LIST CITATIONS *

ZINC (ELEMENTAL ANALYSIS) (<0.10%) 7440-66-6 22

CHLORINE (ELEMENTAL ANALYSIS) 7782-50-5 22

(<0.90%)

CHLORO ALKANES (1.89%) 61788-76-9 21, 22

PHOSPHORODITHOIC ACID, O,O-DI 68649-42-3 22

C1-14-ALKYL ESTERS, ZINC SALTS (2:

1) (ZDDP) (0.72%)

REGULATORY LISTS SEARCHED ---

1=ACGIH ALL 6=IARC 1 11=TSCA 4 16=CA P65 CARC 21=LA RTK

2=ACGIH A1 7=IARC 2A 12=TSCA 5a2 17=CA P65 REPRO 22=MI 293

3=ACGIH A2 8=IARC 2B 13=TSCA 5e 18=CA RTK 23=MN RTK

4=NTCP CARC 9=OSHA CARC 14=TSCA 6 19=FL RTK 24=NJ RTK

5=NTP SUS 10=OSHA Z 15=TSCA 12b 20=IL RTK 25=PA RTK

26=RI RTK

CAUTION!

Exposure to oil mist may result in eye and skin irritation. Excessive exposure to mists may cause respiratory irritation and damage.

Keep container closed. Use with adequate ventilation.

FIRST AID: If inhaled and symptoms develop, remove to fresh air and get medical attention.

For industrial use only. Not intended or suitable for use in or around a household or dwelling.

Refer to product Material Safety Data Sheet for further safety and health information.

For Internal Use Only: MHC: 1* 1* 1* 1*, MPPEC: A, TRN: 603191-00, ELIS: 400225, CMCS97: 970304, REQ: US - MARKETING, SAFE USE: L EHS Approval Date: 17APR2002

Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user and WE EXPRESSLY DISCLAIM ALL WARRANTIES OF EVERY KIND AND NATURE, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE IN RESPECT TO THE USE OR SUITABILITY OF THE PRODUCT. Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users. Alteration of this document is strictly prohibited. Except to the extent required by law, republication or retransmission of this document, in whole or in part, is not permitted. Exxon Mobil Corporation and its affiliated companies assume no responsibility for accuracy of information unless the document is the most current available from an official ExxonMobil distribution system. Exxon Mobil Corporation and its affiliated companies neither represent nor warrant that the format, content or product formulas contained in this document comply with the laws of any other country except the United States of America.

Prepared by: ExxonMobil Oil Corporation
Environmental Health and Safety Department, Clinton, USA

* EPA recently added new chemical substances to its TSCA Section 4 test rules. Please contact the supplier to confirm whether the ingredients in this product currently appear on a TSCA 4 or TSCA 12b list.

Code key:CARC=Carcinogen; SUS=Suspected Carcinogen; REPRO=Reproductive

16. OTHER INFORMATION

USE: ROCK DRILL LUBRICANT

NOTE: PRODUCTS OF EXXON MOBIL CORPORATION AND ITS AFFILIATED COMPANIES ARE NOT FORMULATED TO CONTAIN PCBs.

Health studies have shown that many hydrocarbons pose potential human health risks which may vary from person to person. Information provided on this MSDS reflects intended use. This product should not be used for other applications. In any case, the following advice should be considered:

INJECTION INJURY WARNING: If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

Precautionary Label Text:

Printing date 08.03.2004

Reviewed on 08.03.2004

* 1 Identification of substance:
• Product details:
• Trade name: RENISO TRITON SE 55
• Application of the substance / the preparation: Lubricant
• Manufacturer/Supplier: FUCHS EUROPE SCHMIERSTOFFE GMBH EXPORT DIVISION Friesenheimer Str. 15 D-68169 Mannheim Tel: ++49 (0)621/3701-0 (Switch Board) Fax: ++49 (0)621/3701-570
• Informing department: Product safety department Tel: ++49 (0)621/3701-333 • Emergency information: Tel: ++49 (0)621/3701-333 or ++49 (0)621/3701-0 (Switch Board)
2 Composition/Data on components:
• Chemical characterization: CAS No. Designation: Synthetic ester
• Identification number(s): Composition
3 Hazards identification
• Hazard designation: By handling of mineral oil products and chemical products no particular hazard is known when normal precautions (item 7) and personal protective equipment (item 8) are kept.
• Information pertaining to particular dangers for man and environment This product is water polluting; see item 12.
• Classification system The classification and hazard designation are in line with current EC lists resulting of the so called conventional method of 88/379 EU concerning specific data of compounds.
4 First aid measures
• General information Change clothes and shoes contaminated or soaked by the product. Never put rags contaminated by the product into cloth-pockets.
• After inhalation Supply fresh air; consult doctor in case of symptoms. (eventually by inhaling the overheated product)
• After skin contact The product is not skin irritating.
• After eye contact Rinse opened eye for several minutes under running water.
(Contd. on page 2)

Printing date 08.03.2004

Reviewed on 08.03.2004

Trade name: RENISO TRITON SE 55	(Contd. of page 1)
• After swallowing In case of persistent symptoms consult doctor.	
5 Fire fighting measures	
• Suitable extinguishing agents CO2, extinguishing powder or water jet. Fight larger fires with water jet or alcohol-resistant foam. Use fire fighting measures that suit the environment.	
• For safety reasons unsuitable extinguishing agents Water with a full water jet.	
• Protective equipment: In case of fire fighting: wear self containing breathing apparatus	
6 Accidental release measures	
• Person-related safety precautions: Particular danger of slipping on leaked/ spilled product.	
• Environmental protection measures: Prevent from spreading (e.g. by binding or oil barriers). Do not allow to enter the ground/ soil.	
• Measures for cleaning/collecting: Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust). Dispose of the material collected according to regulations.	
• Additional information: No dangerous materials are released.	
7 Handling and storage	
• Handling • Information for safe handling: Prevent formation of aerosols.	
• Information about protection against explosions and fires: No special measures required.	
• Storage • Requirements to be met by storerooms and containers: No special requirements.	
• Information about storage in one common storage facility: Store away from foodstuffs.	
• Further information about storage conditions: None.	
* 8 Exposure controls and personal protection	
• Additional information about design of technical systems: No further data; see item 7.	
• Components with critical values that require monitoring at the workplace: CAS No. Designation of material % Type Value Unit The product itself does not contain any relevant quantities of	(Contd. on page 3)

MATERIAL SAFETY DATA SHEET
According to 91/155/EC

Printing date 08.03.2004

Reviewed on 08.03.2004

Trade name: RENISO TRITON SE 55				(Contd. of page 2)
materials with critical values that have to be monitored at the workplace.				
• Additional information: The lists that were valid during the compilation were used as basis.				
• Personal protective equipment				
• General protective and hygienic measures The usual precautionary measures should be adhered to in handling the chemicals and the mineral oil products. Avoid close or long term contact with the skin. Use skin protection cream for preventive skin protection. Do not carry cleaning cloths impregnated with the product in trouser pockets.				
• Breathing equipment: Not required.				
• Protection of hands: Not required.				
• Material of gloves The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.				
• Penetration time of glove material The exact break trough time has to be found out by the manufacturer of the protective gloves and has to be observed.				
• Eye protection: Safety glasses recommended during refilling.				
• Body protection: Protective work clothing.				
9 Physical and chemical properties:				
• General Information				
• Form: Fluid				
• Colour: Light yellow				
• Smell: Characteristic				
• Change in condition		Value/Range	Unit	Method
• Melting point/Melting range:		Not determined		
• Boiling point/Boiling range:		Not determined		
• Flash point:		270 ° C	ISO 2592	
• Decomposition temperature:		Not determined		
• Danger of explosion:		Product is not explosive.		
• Density	at 15 ° C	1.01 g/cm3	DIN 51 757	
• Solubility in / Miscibility with				(Contd. on page 4)

MATERIAL SAFETY DATA SHEET
According to 91/155/EC

Printing date 08.03.2004

Reviewed on 08.03.2004

Trade name: RENISO TRITON SE 55				(Contd. of page 3)
• Water: Not miscible or difficult to mix				
• Viscosity or Consistency-Class: • Kinematic: at 40 ° C 55 mm²/s DIN 51 562				
10 Stability and reactivity				
• Thermal decomposition / conditions to be avoided: No decomposition if used according to specifications. • Dangerous reactions No dangerous reactions known • Dangerous products of composition: No dangerous decomposition products known				
11 Toxicological information				
• Acute toxicity: • Primary irritant effect: • on the skin: No irritant effect known. • on the eye: No irritant effect known. • Sensitization: No sensitizing effect known. • Additional toxicological information: The product is not subject to classification according to the calculation method of the General EU Classification Guidelines for Preparations as issued in the latest version. When used and handled according to specifications, the product does not have any harmful effects according to our experience and the information provided to us.				
12 Ecological information:				
• Behaviour in environmental systems: • Mobility and bioaccumulation potential: No data available • Ecotoxicical effects: • Behaviour in sewage processing plants: The product sinks in the sewage water on account of its high specific gravity; eventually it is able to pass the conventional collector for light-density material. • General notes: German Water Endangering Class 1 (Self-assessment): slightly hazardous for water. Do not allow to reach ground water, water bodies or sewage system.				
* 13 Disposal considerations				
• Product: • Recommendation Smaller quantities have to be disposed in line with local legislation. When storing used mineral oil products, ensure that the categories for (Contd. on page 5)				

MATERIAL SAFETY DATA SHEET
According to 91/155/EC

Printing date 08.03.2004

Reviewed on 08.03.2004

Trade name: RENISO TRITON SE 55

(Contd. of page 4)

waste oil and mixing instructions are observed.

Delivery of waste oil only to officially authorized collectors.

- European waste catalogue

13 02 08: other engine, gear and lubricating oils

- Uncleaned packagings:

- Recommendation:

Empty contaminated packagings thoroughly. They can be recycled after thorough and proper cleaning. Small one-way packagings have to be disposed according to the local regulations.

EWC 15 01 99.

14 Transport information

- Land transport ADR/RID and GGVS/GGVE (cross-border/domestic)

- ADR/RID-GGVS/E Class: -

- Maritime transport IMDG/GGVSea:

- IMDG/GGVSea Class: -

- Air transport ICAO-TI and IATA-DGR:

- ICAO/IATA Class: -

- Transport/Additional information:

No dangerous good acc. to dangerous goods/ transport directions.

15 Regulatory information

- Designation according to EU guidelines:

Observe the normal safety regulations when handling chemicals or mineral oil products.

The product is not subject to identification regulations under EC Directives until 2001/59/EC (28. ATP) and the Ordinance on Hazardous Materials. The concentrations of the dangerous compounds, which are possibly specified under point 2, are not above the value for classification. Local regulations must be kept.

- National regulations

- German Water Hazard Class:

Water Engangering Class 1 (Self-assessment): slightly hazardous for water.

16 Other information:

All ingredients are listed in the European Inventories. These data are based on our present knowledge. However, they shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship. This data sheet is a safety

(Contd. on page 6)

MATERIAL SAFETY DATA SHEET
According to 91/155/EC

Printing date 08.03.2004

Reviewed on 08.03.2004

Trade name: RENISO TRITON SE 55

(Contd. of page 5)

data sheet according to 91/155/EU. For products which are not subject to classification according to EU lists this data sheet is made on a voluntary base.

- Department issuing data specification sheet:

FUCHS EUROPE SCHMIERSTOFFE GMBH Export Division

- Product Safety Department

- Contact:


Product Safety Department:

Tel: ++49(0)621/3701-333, Mrs. Manuwald

- Validity:

With this latest edition of this MSDS all former editions are not valid any longer.
Changed items are marked with "***".

- * Data compared to the previous version altered.

	MATERIAL SAFETY DATA SHEET	Page : 1 / 5
		Version : 3
		Date : 22/9/2006
		Supersedes : 8/12/2003
R-227		10227

1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION	
PRODUCT NAME :	R-227
Recommended uses :	Refrigerant Blowing agent
SUPPLIER :	
Name :	DEHON SERVICE
Address :	26, Avenue du Petit Parc 94683 VINCENNES cedex
Telephone number :	01 43 98 75 00
Telefax number :	01 43 98 21 51
Department to contact :	Department Material Safety Data Sheets - TEL : 01 49 83 53 00
* EMERGENCY TELEPHONE NUMBER :	EMERGENCY TELEPHONE NUMBER (24h/24) : +44 (0)208 762 8323 Anti-poison Center : INRS/ORFILA (France) : +33 (0) 1 45 42 59 59

2 COMPOSITION / INFORMATION ON INGREDIENTS	
SUBSTANCE :	
Common chemical name :	1,1,1,2,3,3,3-heptafluoropropane
CAS :	431-89-0
EINECS :	207-079-2

3 HAZARDS IDENTIFICATION	
MOST IMPORTANT HAZARDS :	Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing
Adverse human health effects :	Liquefied gas : Contact with liquid may cause frostbite and serious damage to eyes
Physical and chemical hazards :	Not classified as flammable by EC criteria but may present a hazard in the event of a fire
- Fire or explosion :	According to EC criteria, this product is not classified as a "hazardous substance"
Classification of the product :	

4 FIRST AID MEASURES	
Inhalation :	Move the affected person away from the contaminated area and into the fresh air If the person feels unwell : Call a doctor
Skin contact :	In the event of contact with the liquid: treat resulting frostbite as a burn Rinse with plenty of water. DO NOT remove clothing (since it may stick to the skin).
Eye contact :	If skin burns appear, call a doctor immediately Rinse immediately and thoroughly, pulling the eyelids well away from the eye (15 minutes minimum) Consult an eye specialist immediately
Ingestion :	Not specifically applicable (gas)

DEHON SERVICE 26 Avenue du Petit Parc 94683 VINCENNES Cedex France	In case of emergency : +44 (0)208 762 8323
--	---

	MATERIAL SAFETY DATA SHEET	Page : 2 / 5
		Version : 3
		Date : 22/9/2006
		Supersedes : 8/12/2003
R-227		10227


5 FIRE-FIGHTING MEASURES	
Suitable extinguishing media :	Carbon dioxide (CO2) Powders Foam Water spray
Not suitable extinguishing media :	None to our knowledge. If there is a fire close by, use suitable extinguishing agents
Specific hazards :	Pressurized container. On heating there is a risk of bursting due to internal pressure build-up. On heating : Toxic and corrosive vapours are released
Specific fire fighting methods :	Cool down the containers exposed to heat with a water spray
Protection of fire-fighters :	Self-contained breathing apparatus Complete protective clothing

6 ACCIDENTAL RELEASE MEASURES	
Personal precautions :	Avoid contact with skin and eyes Do not attempt to take action without suitable protective equipment Do not breathe vapours Evacuate the danger area. Stop the leak. Remove all sources of ignition Mechanically ventilate the spillage area (risk of asphyxia)
Methods for cleaning up :	Allow the residual product to evaporate.
- Cleaning/decontamination :	

7 HANDLING AND STORAGE	
HANDLING	Ventilation
Technical measures :	Avoid contact with : - hot surfaces
Precautions :	
STORAGE	
Storage conditions :	Store : - the container tightly closed - in a cool, well-ventilated area - away from any source of ignition
- Recommended :	Alkali metals Alkaline earth metals
Incompatible products :	Ordinary steel. Aluminium.
Packaging materials :	
- Recommended :	

8 EXPOSURE CONTROLS / PERSONAL PROTECTION	
Engineering measures :	Ensure good ventilation of the work station
Occupational exposure limits :	
- USA (ACGIH) :	TWA = 1000 ppm (recommended)
Personal protective equipment :	
- Respiratory protection :	In the event of insufficient ventilation:

DEHON SERVICE 26 Avenue du Petit Parc 94683 VINCENNES Cedex France	In case of emergency : +44 (0)208 762 8323
--	---

	MATERIAL SAFETY DATA SHEET		Page : 3 / 5
			Version : 3
			Date : 22/9/2006
			Supersedes : 8/12/2003
R-227		10227	

8 EXPOSURE CONTROLS / PERSONAL PROTECTION

(continued)

- Hand protection :

Butylrubber protective gloves.

- Eye protection :

Safety spectacles

- Skin and body protection :

Protective clothing (with elasticated cuffs and closed neck)
- Safety foot-wear.

9 PHYSICAL AND CHEMICAL PROPERTIES

- Physical state :

Liquefied gas under pressure
- Colour :

Colourless
- Odour :

slightly ethereal.
- pH :

Not applicable
- Specific temperatures :

-131 °C
- Melting :

- 16.5 °C
- Boiling :

None
- Flammability characteristics :

Non oxidizing material according to EC criteria
- Flash point :

3.9 bar at 20 °C
- Oxidizing properties :

9,16 bar at 50 °C
- Vapour pressure :

4.2
- Vapour density (air = 1) :

Liquid :
- Specific gravity :

1,415 g/cm³ at 20 °C
- Solubility :

0.3 - 0.6 g/l at 20 °C
- In water :

2.5 (log POW)
- Octanol/water partition coefficient :

Liquid :
- Dynamic viscosity :

0.27 mPa.s at 20 °C

10 STABILITY AND REACTIVITY

- Stability :

Stable at ambient temperature and under normal conditions of use
- Hazardous reactions :

- high temperatures
- Conditions to avoid :

- alkali metals
- Materials to avoid :

- alkaline earth metals.
- Hazardous decomposition products :

On thermal decomposition (pyrolysis), releases :
Hydrogen fluoride
Carbon oxides (CO, CO2)

11 TOXICOLOGICAL INFORMATION

- Acute toxicity :

LC 50 inhalation/ 4 h/rat : > 11 %
- Acute symptoms :

At high concentrations:
Narcosis
Cardiac disorders
Anoxia (asphyxia).

	MATERIAL SAFETY DATA SHEET		Page : 4 / 5
			Version : 3
			Date : 22/9/2006
			Supersedes : 8/12/2003
R-227		10227	

11 TOXICOLOGICAL INFORMATION

(continued)

- Local effects :

Contact with liquid causes frostbite.
Prolonged or repeated contacts with the skin may cause dermatitis
Contact with liquefied gas may cause severe ocular lesions
- Specific effects :

No mutagenic effect
- Mutagenicity :

No teratogenic effect
- Reproductive toxicity :

12 ECOLOGICAL INFORMATION

- MOBILITY :

Air : Henry's constant : 264 GPa.m³/mol
- Volatility :

Product is volatile
- DEGRADABILITY :

Half-life : 25 y
- indirect photo-oxidation :

20 % biodegradation after 28 days
- Aerobic biodegradability :

Not readily biodegradable
- BIOACCUMULATION :

2.5
- Octanol/water partition coefficient :

Low bioaccumulation potential
- ECOTOXICITY :

LC 0 (Fish : Brachydanio rerio) / 96 h : > 30 mg/l mg/l
- Effects on the aquatic environment :

ODP (R-11=1)=0
- OTHER ADVERSE EFFECTS :

GWP (CO2=1) = 4300
- Ozone depletion potential :
- Greenhouse effect :

13 DISPOSAL CONSIDERATIONS

- WASTE FROM PRODUCT :

Consult the manufacturer or supplier for information regarding recovery and recycling of the product
- Destruction/Disposal :
- CONTAMINATED PACKAGING :

Reuse or recycle following decontamination.
Destroy at an authorised site
- Destruction/Disposal :

The user's attention is drawn to the possible existence of specific european, national or local regulations regarding disposal
- NOTE :

14 TRANSPORT INFORMATION


- INTERNATIONAL REGULATIONS :

3296 - HEPTAFLUOROPROPANE (REFRIGERANT GAS R227)
- UN number :
- Land :

Class : 2
Classification code : 2A
- Rail/road (RID/ADR) :

Packaging group : -
Labelling : 2.2
Hazard identification number : 20
- Sea (IMO/IMDG) :

Class : 2.2
Packaging group : -
Labelling : 2.2

	MATERIAL SAFETY DATA SHEET	Page : 5 / 5
		Version : 3
		Date : 22/9/2006
		Supersedes : 8/12/2003
R-227		10227

14 TRANSPORT INFORMATION	(continued)
---------------------------------	--------------------

Air (ICAO-IATA) : Class : 2.2
Packing group : -
Labelling : 2.2

NOTE : The above regulatory prescriptions are those valid on the date of publication of this sheet
However, given the possible evolution of transport regulations for hazardous materials, in case the present sheet is dating back to more than 12 months ago, it would be advisable to check their validity with your commercial agency

15 REGULATORY INFORMATION

EC LABELLING :
- R phrases : No R phrase
- S phrases : No S phrase

NOTE : The regulatory information given in this part only indicate the principal regulations specifically applicable to the product described in the Safety Data Sheet.
The cited basic Community texts are being updated and transcribed in national law.
Refer to all applicable national, international and local regulations or provisions.
The user's attention is drawn to the possible existence of additional provisions which complete these regulations.

16 OTHER INFORMATION

Further information: Product for industrial use only
For more information regarding the use of this product, please refer to our technical information or contact the sales department in your region

* Update : This sheet was updated (refer to the date at the top of this page)
Modifications are indicated by an asterisk (*)

This sheet complements the technical sheets but does not replace them. The information given is based on our knowledge of the product, at the time of publication. It is given in good faith.
Besides, the attention of the user is drawn to the possible risks incurred by using the product for any other use than that for which it was intended.
In no way does this exempt the user from knowing and applying all the regulations controlling his activity. He alone will take on the responsibility for taking the precautions involved by the use of the product.
The aim of all the mandatory regulations mentioned is just to help the user to fulfil his obligations regarding the use of hazardous products.

This information must not be considered exhaustive. It does not exempt the user from ensuring that other obligations than those mentioned could apply, related to the storage and use of the product, this being his sole responsibility.

End of document



P.O. Box 3241
Milwaukee, WI 53201-3341, USA

MATERIAL SAFETY DATA SHEET

Product Health and Safety Data
PRODUCT: HF-95X, HF-95Y, HF-95Z

SECTION I – IDENTIFICATION OF THE SUBSTANCE/PREPARATIONS/SUPPLIER

PRODUCT: HF-95X, HF-95Y, HF-95Z
SUPPLIER: Enerpac B.V., P.O. Box 8097, 6710 AB Ede, The Netherlands,
Tel.: +31 318 535 911
PRODUCT CODE: BSL919885
DESCRIPTION: Hydraulic Fluid

For specific application advice see the appropriate Instruction Sheet or contact your Enerpac representative.

REVISION: 4 April 2002
SUPERSEDES: 12 NOVEMBER 1996
REVISION CHANGES:
Updated.

EMERGENCY TELEPHONE NUMBERS:

Netherlands: 010 4175 111 NVIC: 030 274 88 88 [This number should be called, in case of an emergency, only by the referred medical doctor in charge.]
Belgium: 03 286 08 11 A + E centre: 070 245 245

SECTION II – COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL COMPOSITION: Highly refined oil (IP 346 DMSO extract <3%)
Proprietary performance additives.
HAZARDOUS INGREDIENT: No component is present at sufficient concentration to require a hazardous classification.

SECTION III – HAZARD IDENTIFICATION

This material is not considered to be hazardous, but should be handled in accordance with good industrial hygiene and safety practices. In common with most mineral oils, prolonged and repeated skin contact may cause dermatitis.
Note: High Pressure Applications
Injections through the skin resulting from contact with the product at high pressure constitute a major medical emergency.
See "Medical Advice" Under First-Aid Measures, Section 4 of this Safety Data Sheet.
Handling precautions should be strictly observed.

SECTION IV – FIRST AID MEASURES

EYES:
Wash eye thoroughly with copious quantities of water, ensuring eyelids are held open. Obtain medical advice if any pain or redness develops or persists.



P.O. Box 3241
Milwaukee, WI 53201-3341, USA

MATERIAL SAFETY DATA SHEET

Product Health and Safety Data
PRODUCT: HF-95X, HF-95Y, HF-95Z

SECTION IV – FIRST AID, cont.

SKIN CONTACT:
Wash skin thoroughly with soap and water as soon as reasonably practicable. Remove heavily contaminated clothing and wash underlying skin.
INGESTION:
If contamination of the mouth occurs, wash out thoroughly with water.
Except as a deliberate act, the ingestion of large amounts of product is unlikely. If it should occur, do not induce vomiting; obtain medical advice.

MEDICAL ADVICE:
Treatment should in general be symptomatic and directed to relieving any effects.
Note: High Pressure Applications
Injections through the skin, resulting from contact with the product at high pressure, constitute a major medical emergency. Injuries may not appear serious at first but within a few hours tissue becomes swollen, discolored and extremely painful with extensive subcutaneous necrosis.
Surgical exploration should be undertaken without delay. Thorough and extensive debridement of the wound and underlying tissue is necessary to minimize tissue loss and prevent or limit permanent damage. Note that high pressure may force the product considerable distances along tissue planes.

SECTION V – FIRE-FIGHTING MEASURES

Use foam, dry powder or water fog. DO NOT USE water jets.
Fires in confined spaces should be dealt with by trained personnel wearing approved breathing apparatus.
Water may be used to cool nearby heat exposed areas/objects/packages. Avoid spraying directly into storage containers because of the danger of boil-over.

COMBUSTION PRODUCTS:
Toxic fumes may be evolved on burning or exposure to heat.
See Stability and Reactivity, Section 10 of this Safety Data Sheet.

SECTION VI – ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS: See Section 8.
Contain and recover spilled material using sand or other suitable inert absorbent material.
It is advised that stocks of suitable absorbent material should be held in quantities sufficient to deal with any spillage which may be reasonably anticipated.
Spilled material may make surfaces slippery.
Protect drains from potential spills to minimize contamination. Do not wash product into drainage system.
In the case of large spills contact the appropriate authorities.
In the case of spillage on water, prevent the spread of product by the use of suitable barrier equipment. Recover product from the surface. Protect environmentally sensitive areas and water supplies.

MATERIAL SAFETY DATA SHEET

Product Health and Safety Data
PRODUCT: HF-95X, HF-95Y, HF-95Z

SECTION VII – HANDLING AND STORAGE

HANDLING PRECAUTIONS:

Avoid contact with eyes. If splashing is likely to occur wear a full face visor or chemical goggles as appropriate.
Avoid frequent or prolonged skin contact with fresh or used product.
Good working practices, high standards of personal hygiene and plant cleanliness must be maintained at all times.
Wash hands thoroughly after contact.
Use disposable cloths and discard when soiled. Do not put soiled cloths into pockets.

FIRE PREVENTION:

Product contaminated rags, paper or material used to absorb spillage, represent a fire hazard, and should not be allowed to accumulate. Dispose of safely immediately after use.

STORAGE CONDITIONS:

Store under cover and protect from heat and sources of ignition.

LOAD/UNLOAD TEMPERATURE deg. C: Ambient to 40

STORAGE TEMPERATURE deg. C: Ambient to 40

SPECIAL PRECAUTIONS:

Keep containers closed when not in use.
Prevent small spills and leakages to avoid slip hazard.

SECTION VIII – EXPOSURE CONTROLS AND PERSONAL PROTECTION

EXPOSURE LIMITS:

There is no appropriate occupational exposure limit for this material.

Ensure good ventilation.

Avoid, as far as reasonably practicable, inhalation of vapor, mists or fumes generated during use.

If vapor, mists or fumes are generated, their concentration in the workplace air should be controlled to the lowest reasonably practicable level.

PROTECTIVE CLOTHING:

Wear face visor or goggles in circumstances where eye contact can accidentally occur.

If skin contact is likely, wear impervious protective clothing and/or gloves.

Protective clothing should be regularly laundered or dry cleaned. Change heavily contaminated clothing as soon as reasonably possible; dry clean, launder and preferably starch before re-use. Wash any contaminated underlying skin with soap and water.

RESPIRATORY PROTECTION:

Respiratory protection is unnecessary, provided the concentration or vapor, mists or fumes is adequately controlled. The use of respiratory equipment must be strictly in accordance with the manufacturers' instructions and any statutory requirements governing its selection and use.

MATERIAL SAFETY DATA SHEET

Product Health and Safety Data
PRODUCT: HF-95X, HF-95Y, HF-95Z

SECTION IX – PHYSICAL AND CHEMICAL PROPERTIES

TYPICAL VALUES

Grades:	Test Method	Units	
Physical state			liquid
Color			blue
Odor			oily
Density @ 15°C	ASTM D 1298	kg/m³	878
Kinematic viscosity @ 40°C	ASTM D 445	mm²/s	32
Pour point	ASTM D 97	%C	max -30

SECTION X – STABILITY AND REACTIVITY

Products of this type are stable and unlikely to react in a hazardous manner under normal conditions of use.
Hazardous polymerization reactions will not occur.
This material is combustible.

MATERIALS TO AVOID:

Avoid contact with strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS:

Thermal decomposition products will vary with conditions.
Incomplete combustion will generate smoke, carbon dioxide and hazardous gases, including carbon monoxide.

SECTION XI – TOXICOLOGICAL INFORMATION

EYES:

Unlikely to cause more than transient stinging or redness if accidental eye contact occurs.

SKIN:

Unlikely to cause harm to the skin on brief or occasional contact but prolonged or exposure may lead to dermatitis.

INGESTION:

Unlikely to cause harm if accidentally swallowed in small doses, though larger quantities may cause nausea and diarrhoea.

INHALATION:

Air normal ambient temperatures this product will be unlikely to presents an inhalation hazard because of its volatility.

May cause irritation to eyes, nose and throat due to exposure to vapor, mists or fumes. May be harmful by inhalation if exposure to vapor, mists or fumes thermal decomposition products occurs.



MATERIAL SAFETY DATA SHEET

Product Health and Safety Data
PRODUCT: HF-95X, HF-95Y, HF-95Z

SECTION XII – ECOLOGICAL INFORMATION

MOBILITY:

Spillage may penetrate the soil causing ground water contamination

PERSISTENCE AND DEGRADABILITY:

This product is inherently biodegradable.

BIO-ACCUMULATIVE POTENTIAL:

There is no evidence to suggest bio-accumulation will occur.

AQUATIC TOXICITY:

Spill may form a film on water surfaces causing physical damage to organisms. Oxygen transfer could also be impaired.

SECTION XIII – DISPOSAL CONSIDERATIONS

Where possible, arrange for product to be recycled.
Dispose of via an authorized person/licensed waste disposal contractor in accordance with local regulations.
Incineration may be carried out under controlled conditions provided that local regulations for emissions are met.

SECTION XIV – TRANSPORT INFORMATION

Not classified as hazardous for transport (ADR, RID, UN, IMD, IATA/ICAO)
Rail cars, tank trucks, drums. All firmly closed during transportation with zero leakage. Shipping containers have to be fully resistant against highly refined mineral-based oils.
TRANSPORT TEMPERATURE deg. C: Ambient to 40°C

SECTION XV – REGULATORY INFORMATION

Not classified as hazardous for supply.
Refer to your national legislation implementing the EC Directive 91/155/EG



MATERIAL SAFETY DATA SHEET

Product Health and Safety Data
PRODUCT: HF-95X, HF-95Y, HF-95Z

SECTION XVI – OTHER INFORMATION

Translated by:

Enerpac B.V.
P.O. Box 8097
6710 AB EDE
The Netherlands

This data sheet and the health, safety and environmental information it contains is considered to be accurate as of the date specified above. We have reviewed any information contained herein which we received from sources outside Enerpac and the Actuant Corp. However, no warranty or representation, express or implied is made as to the accuracy or completeness of the data and information contained in this data sheet.

Health and safety precautions and environmental advice noted in this data sheet may not be accurate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations.

No statement made in this data sheet shall be construed as a permission, recommendation or authorization given or implied to practice any patented invention without a valid license. Enerpac and the Actuant Corp. shall not be responsible for any damage or injury resulting from abnormal use of the material, from any failure to adhere to recommendations, or from any hazards inherent in the nature of the material.



Material Safety Data Sheet

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

MULTIFAK EP 2

Product Use: Grease
Product Number(s): 40995

Company Identification
Chevron Products UK Limited
1 Westferry Circus
Canary Wharf
London E14 4HA
United Kingdom
+44(0)20 77 19 3000

Transportation Emergency Response

Europe: 0044(0)18 65 407333
Health Emergency
Chevron Emergency Information Center: Emergency Information Centers are located in the USA.
International collect calls accepted: (800) 231-0623 or (510) 231-0623

Product Information

Product Information: +44(0)20 77 19 3000
FAX number: +44(0)20 77 19 5171

SECTION 2 COMPOSITION/ INFORMATION ON INGREDIENTS

COMPONENTS	EC NUMBER	SYMBOL / RISK PHRASES	AMOUNT
Highly refined mineral oil (C15 - C50)	*	None	> 80 %weight
Zinc alkyl dithiophosphate	272-028-3	Xi/R38, Xi/R41, N/R51/53	0 - 2.0 %weight

*Contains one or more of the following EINECS numbers: 265-090-8, 265-091-3, 265-096-0, 265-097-6, 265-098-1, 265-101-6, 265-155-0, 265-156-6, 265-157-1, 265-158-7, 265-159-2, 265-160-8, 265-161-3, 265-166-0, 265-169-7, 265-176-5, 276-735-8, 276-736-3, 276-737-9, 276-738-4, 278-012-2. The full text of all R-phrases is shown in Section 16.

SECTION 3 HAZARDS IDENTIFICATION

CLASSIFICATION: Not classified as dangerous according to EU regulatory guidelines.

IMMEDIATE HEALTH EFFECTS

Eye: Not expected to cause prolonged or significant eye irritation.

Skin: Contact with the skin is not expected to be harmful. High-Pressure Equipment Information: Accidental high-velocity injection under the skin of materials of this type may result in serious injury. Seek medical attention at once should an accident like this occur. The initial wound at the injection site may not appear to be serious at first; but, if left untreated, could result in disfigurement or amputation of the

Revision Number: 1
Revision Date: MARCH 14, 2007

1 of 6

MULTIFAK EP 2
MSDS : 14246GBR

affected part.

Ingestion: Not expected to be harmful if swallowed. Contains a petroleum-based mineral oil. May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of oil mist at airborne levels above the recommended mineral oil mist exposure limit. Symptoms of respiratory irritation may include coughing and difficulty breathing.

DELAYED OR OTHER HEALTH EFFECTS: Not classified.

ENVIRONMENTAL EFFECTS: Not classified.

SECTION 4 FIRST AID MEASURES

Eye: No specific first aid measures are required. As a precaution, remove contact lenses, if worn, and flush eyes with water.

Skin: No specific first aid measures are required. As a precaution, remove clothing and shoes if contaminated. To remove the material from skin, apply a waterless hand cleaner, mineral oil, or petroleum jelly. Then wash with soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse.

Ingestion: No specific first aid measures are required. Do not induce vomiting. As a precaution, get medical advice.

Inhalation: No specific first aid measures are required. If exposed to excessive levels of material in the air, move the exposed person to fresh air. Get medical attention if coughing or respiratory discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

Flashpoint: (Cleveland Open Cup) > 150 °C (> 302 °F)

Autoignition: No Data Available

Flammability (Explosive) Limits (% by volume in air): Lower: No data available Upper: No data available

EXTINGUISHING MEDIA: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

PROTECTION OF FIRE FIGHTERS:

Fire Fighting Instructions: This material will burn although it is not easily ignited. For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.

Combustion Products: Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids, and gases including carbon monoxide, carbon dioxide, and unidentified organic compounds will be evolved when this material undergoes combustion.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Protective Measures: Eliminate all sources of ignition in vicinity of spilled material.

Spill Management: Stop the source of the release if you can do it without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner

Revision Number: 1
Revision Date: MARCH 14, 2007

2 of 6

MULTIFAK EP 2
MSDS : 14246GBR

consistent with applicable regulations.

Reporting: Report spills to local authorities as appropriate or required.

SECTION 7 HANDLING AND STORAGE

Specific Use: Grease

General Handling Information: Avoid contaminating soil or releasing this material into sewage and drainage systems and bodies of water.
Static Hazard: Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures.

Container Warnings: Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner or disposed of properly.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

GENERAL CONSIDERATIONS:

Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances. Refer to appropriate CEN standards.

ENGINEERING CONTROLS:

Use in a well-ventilated area.

PERSONAL PROTECTIVE EQUIPMENT

Eye/Face Protection: No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.

Skin Protection: No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances in the workplace. Suggested materials for protective gloves include: Nitrile Rubber.

Respiratory Protection: No respiratory protection is normally required. If user operations generate an oil mist, determine if airborne concentrations are below the occupational exposure limit for mineral oil mist. If not, wear an approved respirator that provides adequate protection from the measured concentrations of this material. For air-purifying respirators use a particulate cartridge.

Occupational Exposure Limits:

Component	Country/ Agency	TWA	STEL	Ceiling	Notation
Highly refined mineral oil (C15 - C50)	United Kingdom	5 mg/m3	10 mg/m3	--	--

Revision Number: 1

Revision Date: MARCH 14, 2007

3 of 6

MULTIFAK EP 2
MSDS : 14246GBR

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Attention: the data below are typical values and do not constitute a specification.

Color: Light to Brown
Physical State: Liquid
Odor: Petroleum odor
pH: No data available
Vapor Pressure: No data available
Vapor Density (Air = 1): No data available
Boiling Point: No Data Available
Solubility: Insoluble
Freezing Point: No Data Available
Density: >0.923 kg/l
Viscosity: No data available

SECTION 10 STABILITY AND REACTIVITY

Chemical Stability: This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Incompatibility With Other Materials: May react with strong acids or strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.
Hazardous Polymerization: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

IMMEDIATE HEALTH EFFECTS

Eye Irritation: The eye irritation hazard is based on evaluation of data for similar materials or product components.

Skin Irritation: The skin irritation hazard is based on evaluation of data for similar materials or product components.

Skin Sensitization: The skin sensitization hazard is based on evaluation of data for similar materials or product components.

Acute Dermal Toxicity: The acute dermal toxicity hazard is based on evaluation of data for similar materials or product components.

Acute Oral Toxicity: The acute oral toxicity hazard is based on evaluation of data for similar materials or product components.

Acute Inhalation Toxicity: The acute inhalation toxicity hazard is based on evaluation of data for similar materials or product components.

ADDITIONAL TOXICOLOGY INFORMATION:

In accordance with the Directive 94/69/EC (21st ATP to DSD), Nota L, reference IP 346/92: "DMSO Extraction Method", we have determined that the base oils used in this preparation are not carcinogenic.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY

This material is not expected to be harmful to aquatic organisms. The product has not been tested. The statement has been derived from the properties of the individual components.

Revision Number: 1

Revision Date: MARCH 14, 2007

4 of 6

MULTIFAK EP 2
MSDS : 14246GBR

MOBILITY

No data available.

PERSISTENCE AND DEGRADABILITY

This material is not expected to be readily biodegradable. The product has not been tested. The statement has been derived from the properties of the individual components.

POTENTIAL TO BIOACCUMULATE

Bioconcentration Factor: No data available.

Octanol/Water Partition Coefficient: No Data Available

SECTION 13 DISPOSAL CONSIDERATIONS

Use material for its intended purpose or recycle if possible. Oil collection services are available for used oil recycling or disposal. Place contaminated materials in containers and dispose of in a manner consistent with applicable regulations. Contact your sales representative or local environmental or health authorities for approved disposal or recycling methods.

In accordance with European Waste Catalogue (E.W.C.) the codification is the following: 12 01 12

SECTION 14 TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult appropriate Dangerous Goods Regulations for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

ADR/RID Shipping Description: NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORT UNDER ADR

ICAO/IATA Shipping Description: NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORT UNDER ICAO

IMO/MDG Shipping Description: NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORT UNDER THE IMDG CODE

SECTION 15 REGULATORY INFORMATION

REGULATORY LISTS SEARCHED:

- 01=EU. Directive 76/769/EEC: Restrictions on the marketing and use of certain dangerous substances.
- 02=EU Directive 90/394/EEC: Carcinogens at work.
- 03=EU Directive 92/85/EEC: Pregnant or breastfeeding workers.
- 04=EU Directive 96/82/EC (Seveso II): Article 9.
- 05=EU Directive 96/82/EC (Seveso II): Articles 6 and 7.
- 06=EU Directive 98/24/EC: Chemical agents at work.

No components of this material were found on the regulatory lists above.

CHEMICAL INVENTORIES:

All components comply with the following chemical inventory requirements: EINECS (European Union), TSCA (United States).

CLASSIFICATION - LABELING:

Under the criteria of the directive EEC/67/548 (dangerous substances) and EEC/1999/45 (dangerous preparations): Not classified

Revision Number: 1
Revision Date: MARCH 14, 2007

5 of 6

MULTIFAK EP 2
MSDS : 14246GBR

SECTION 16 OTHER INFORMATION

REVISION STATEMENT: This revision updates the following sections of this Material Safety Data Sheet: 2

Revision Date: MARCH 14, 2007

Full text of R-phrases:

R38: Irritating to skin.

R41: Risk of serious damage to eyes.

R51/53: Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

TLV - Threshold Limit Value	TWA - Time Weighted Average
STEL - Short-term Exposure Limit	PEL - Permissible Exposure Limit
CVX - Chevron	CAS - Chemical Abstract Service Number

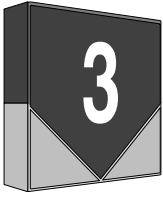
Prepared according to the criteria of the directive 2001/58/EC by the Chevron Energy Technology Company, 100 Chevron Way, Richmond, California 94802.

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

Revision Number: 1
Revision Date: MARCH 14, 2007

6 of 6

MULTIFAK EP 2
MSDS : 14246GBR



PREVENTIVE MAINTENANCE

CONTENTS OF THE CHAPTER

MAINTENANCE GENERALITIES	3.1-1
LIST OF RECOMMENDED LUBRICANTS	3.2-1
MAINTENANCE PERIODS	3.3-1



3.1 MAINTENANCE GENERALITIES

1. MAINTENANCE GENERAL PRECAUTION



WARNING

In case of an access on the crane with a platform lift, a scaffolding or any other means, disconnect the power supply of the Long travel and Tapping trolleys.

WARNING

Reassemble imperatively the “anti-loosening washer kit” after all vertical movement cylinders replacement (see MECHANICAL MAINTENANCE chapter)

2. LUBRICANTS SAFETY AND PRECAUTION



WARNING

Oil quantities are indicative.

Check actual level after filling through the appropriate plug.

In general, the reducers are delivered filled with ECL recommended oil.

Check the oil presence and oil level before any motion.

WARNING

Lubricants, solvents and detergents are toxic / harmful to health :

- they may cause irritation in direct contact with the skin
- they may cause intoxication if inhaled
- they can be fatal if swallowed

Handle them with care using suitable individual safety equipment. Do not dump into the environment and dispose of in compliance with applicable legislation.

3. LUBRICANTS GENERAL INFORMATION



INFORMATION

The oil will drain better if it is warm.

INFORMATION

The hydraulic unit maintenance is included in the specific hydraulic chapter.

GUARANTEE

The guarantee applies only if the lubricants recommended by ECL[®] in the maintenance manual are used.

The use of any other lubricant is under the sole responsibility for the user.

3.2 LIST OF RECOMMENDED LUBRICANTS

1. LUBRICANT TO BE USED

Component to be lubricated	Qty	Recommended lubricants	Qty	Oil	Grease	Lubricated at the installation on site
LONG TRAVEL TROLLEY						
Reducer KH127 – M4	2	MOBIL SHC 630	2x52 l	X		X
Driving / Idle / Guiding wheels	2 / 3 / 4	MOBILGREASE XHP 322 SPECIAL	1,5 kg*		X	
Idle wheel with encoder	1	MOBILGREASE XHP 322 SPECIAL	≈ 1,5 kg		X	X
Compressor FX4	1	RENISO SE 55	2,6 l	X		
Refrigerant	2	FRIGORIC GAS R227	16 kg		GAZ	
AIR COMPRESSED UNIT						
Compressor	1	MOBIL 1 5W50	2x33 l	X		X
Motor compressor	1	MOBILGREASE XHP 103	Make up		X	
CROSS TRAVEL TROLLEY						
Reducer KH97 – M4	2	MOBIL SHC 630	2x15,7 l	X		X
Driving / Idle / Guiding wheels	2 / 2 / 4	MOBILGREASE XHP 322 SPECIAL	0,8 kg*		X	
TURRET ROTATION						
Tank / Baffle of the rotation mechanism	1	MOBILGEAR XMP 320	36 l	X		X
Reducer 305 –Mounting O –	1	MOBIL SHC 630	3,2 l	X		X
5T HOIST UNIT						
Hoist unit	1	MOBILGEAR 634	2 l	X		X
Cable, drum, pulley		MOBILARMA MT	Make up		X	X
TOOLS SUSPENSION						
Grease nipples on axles		MULTIFAK EP2	Make up		X	
EXTRACTING & TIGHTENING MECHANISM						
Bearings and articulations		MULTIFAK EP2	Make up		X	X
CLEANING SHOVEL						
Bearings and articulations		MULTIFAK EP2	Make up		X	X
Buckets articulations		LUBRICOMET AS 767	Make up		X	
HOPPER DISCHARGE MECHANISM						
Reducer – Bath pipe hoisting KA47 – M1	1	MOBIL SHC 630	0,8 l	X		X
Reducer – Bath pipe rotation RF37 – M4	1	MOBIL SHC 630	1,05 l	X		X
Cable, drum, pulley		MOBILARMA MT	Make up		X	X
Feeder – Bearings		MULTIFAK EP2	Make up		X	
Feeder – Reducer FA57 – M6	1	MOBIL SHC 630	3 l	X		
CRUST BREAKING MECHANISM						
Bearings and articulations		MULTIFAK EP2	Make up		X	X
Lubricator	1	MOBIL ALMO 527	8 l	X		X
HYDRAULIC UNIT						
Oil Tank	1	QUINTOLUBRIC 888–68	300 l	X		X
TAPPING TOOLS						
Reducer MC3 – PL 07	1	MOBIL SHC 630	47 l	X		X
Cable, drum, pulley		MOBILARMA MT	Make up		X	X

MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

Hydraulic unit CE8L	1	TELLUS T32	8 l	X		X
Bearings and articulations		MULTIFAK EP2	Make up		X	X
Reducer cyclodrive / shouldered axle		MULTIFAK EP2	Make up		X	
CABIN						
Bearings and articulations	1	MULTIFAK EP2	Make up		X	
Compressor FX4	1	RENISO SE 55	2,6 l	X		
Refrigerant	1	FRIGORIC GAS R227	16 kg		GAZ	

2. TOTAL LUBRICANT QUANTITIES AND DISTRIBUTORS



INFORMATION

The quantities quoted in this document are given approximately. Please refer to the supplier documentation of each component (reducer, air compressor unit, hydraulic unit...) to respect the correct lubricant quantities for a good operation.

Recommended lubricants (**)	Total Qty for one machine	Distributor
QUINTOLUBRIC 888-68	≈ 300 l	QUAKER CHEMICAL
MOBILGREASE XHP 322 SPECIAL	4 kg	MOBIL
MOBILGEAR XMP 320	36 l	
MOBIL SHC 630	≈ 87 l	
MOBILGEAR 634	2 l	
MOBIL 1 5W50	≈ 70 l	
MOBILARMA MT	≈ 1 kg	
MOBILGREASE XHP 103	≈ 0,5 kg	
MOBIL ALMO 527	8 l	
RENISO SE 55	≈ 6 l	FUCHS
FRIGORIFIC GAZ R227	32 kg	AIR LIQUIDE
LUBRICOMET AS 767	≈ 0,5 kg	LOCTITE
TELLUS T32	8 l	SHELL
MULTIFAK EP2	≈ 0,5 l	TEXACO

(*) Total quantity in case of regreasing

(**) Temperature for use : +5°C to +60°C

3.3 MAINTENANCE PERIODS

Code	Definition	Principle
100	Every 100 hours	Periodicity to be multiplied by its multiplying coefficient: 100 x 3 = 300 h 1000 x 8 = 8000 h M x 2 = 2 months Y x 5 = 5 years
1000	Every 1000 hours	
M	Every month (s)	
Y	Every year (s)	
L	No maintenance	

NOTE :

"OPERATING INSPECTION" means :

- do work the equipment on all its stroke
- check that nothing blocks its correct operating
- check that limit switches are operational
- detect any abnormal noise

"TIGHTENING TORQUE" means :

- If there is no torque on drawing, please refer you to the ECL standard torque table page 4.1-6
- The 'standard' concerning the main fixings has been defined by our engineering department at 1 month after starting of the equipment and then after 1 year.



WARNING

For the welds verification, please refer to the chapter 10.

MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

N°	Inspection	See chap	After starting			Periodic maintenance				
			100	1000	M	100	1000	M	Y	L
CRANE STRUCTURE										
1.	Main assemblings - Tightening torque of the fixings - Dry cleaning - Visual inspection of general condition (cracks, abnormal deformation)	4			1			6 6	1	
2.	Assembling with insulating parts - Visual inspection of the fixings - Dry cleaning - Visual inspection of general condition (cracks)	4			1			6 6	1	
3.	Rails on girder - Visual inspection of the fixings : check all fixings are present - Tightening torque of the fixings : - Check 10% of torques of fixings random - Check the torque of all fixings				1			6	1 2	
4.	Bumpers on girders - Tightening torque of the fixings - Visual inspection of general condition (cracks, abnormal deformation)				1			6	1	
5.	Power shoes bracket - Tightening torque of the fixings - Visual Inspection of general deformation (cracks, abnormal deformation) - Cleaning of the insulators by blowing - Wear and tear of the shoes (see supplier manual)	7			1			6 6 6	1	
6.	Limit switch - Cleanness and operating inspection (Dry cleaning and gap adjustment) - Fixings inspection : check sensors can't move							3 6		
7.	Safety line - Tightening torque of the supports fixing - Visual inspection of general condition, operation test	4			1			6 6		

Figure 1 - Power shoes bracket

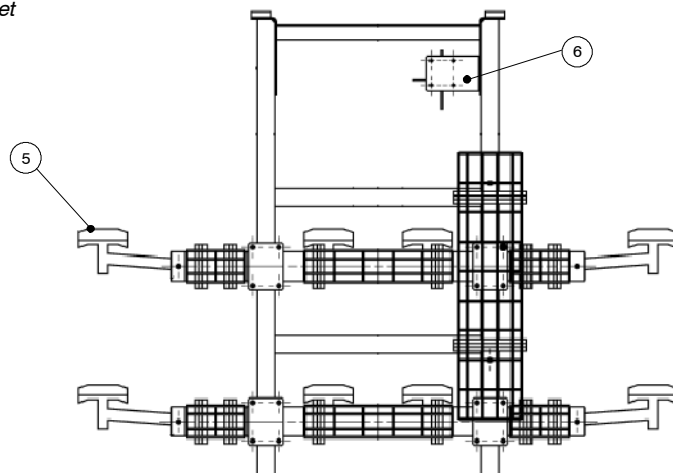
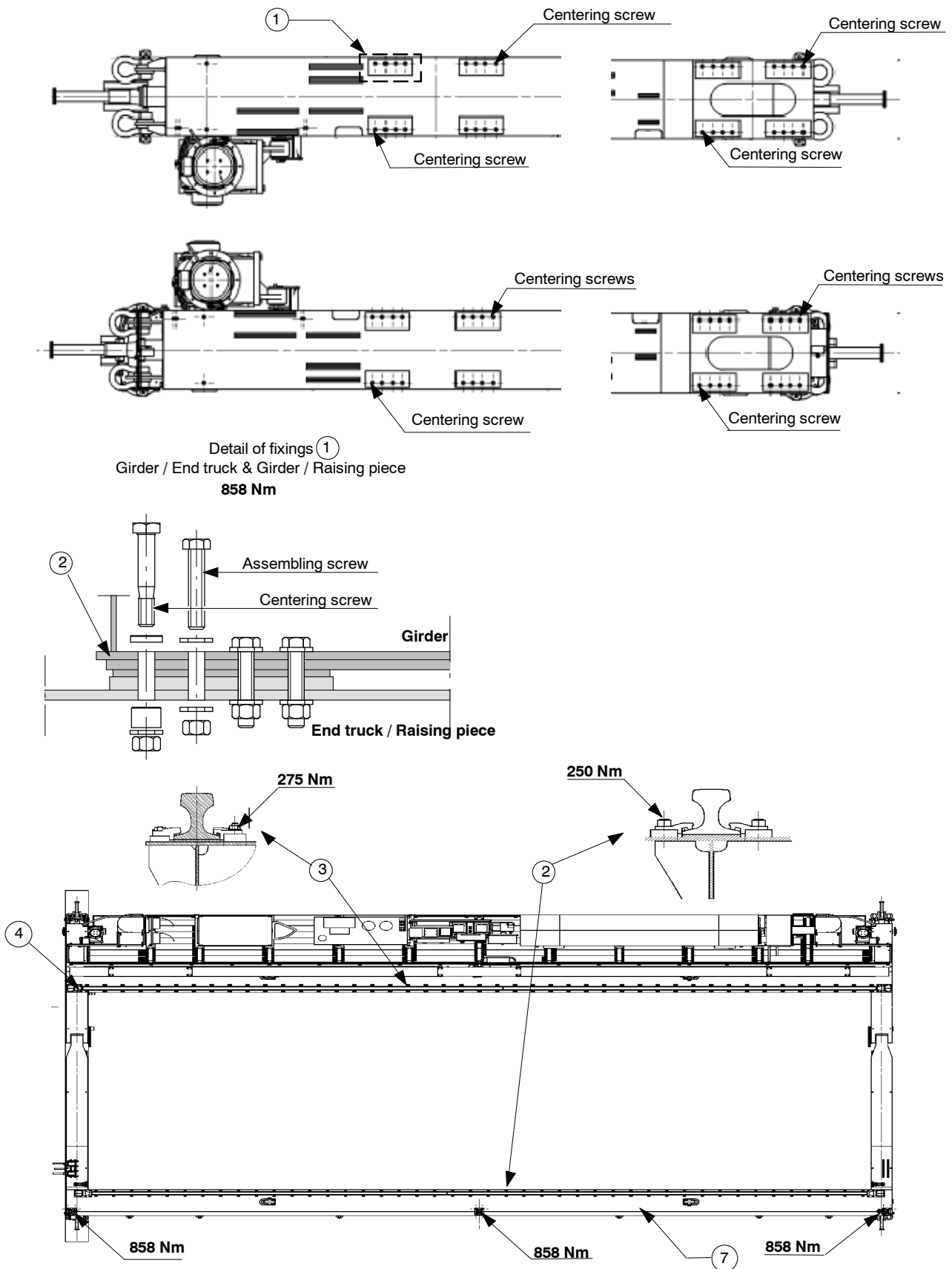


Figure 2 - Detail of Girders / End trucks or Trailers fixing



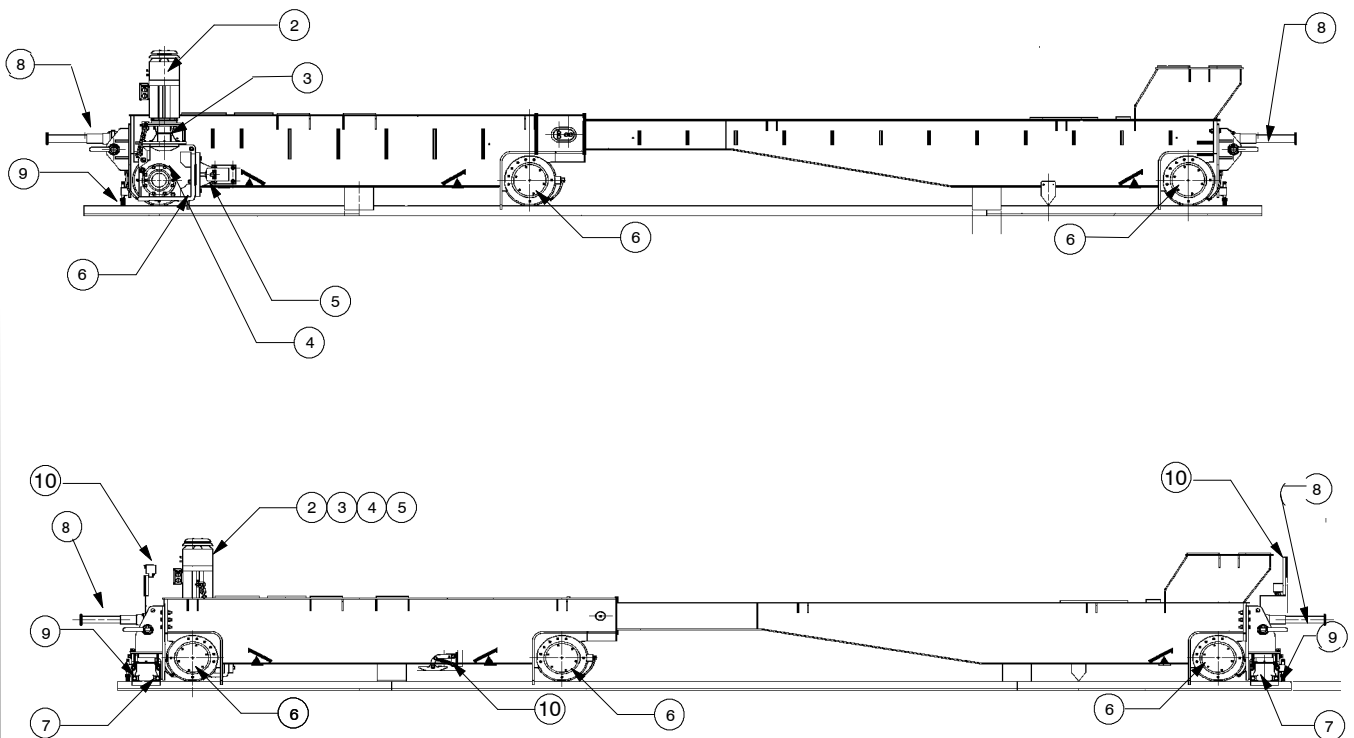
MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

N°	Inspection	See Chap	After starting			Periodic maintenance				
			100	1000	M	100	1000	M	Y	L
LONG TRAVEL TROLLEY										
MAINTENANCE NOTE : In case of long travel wheel encoder replacement, it is necessary to init encoder settings only when crane is on transfer gantry in passageway (automatic initialization).										
1.	Main assembling - Tightening torque of the fixings - Dry cleaning - Visual inspection of general condition (cracks, abnormal deformation)	4			1 1			6	1 1	
2.	Motor Key recommendations (See supplier manual for more recommendations) - Inspect the brake - Inspect the motor	7					10		1	
3.	Coupling box (See supplier manual for more recommendations) - Check torsional play - Visually check the elastic annular gear - Check running noise for possible bearing damage - Visually check the adapter for leakage - Renew the anti-friction bearing grease - Replace oil seal - Change the elastic annular gear	4					3 3 3 3 25 25 25			
4.	Reducer Key recommendations (See supplier manual for more recommendations) - Check oil and oil level - Check running noise for possible bearing damage - Visually check the seals for leakage - Change oil - Replace anti-friction bearing grease - Fixing inspection - Visual inspection and cleaning of the vent plug	4	2		1		3 3 3		2 2 1	
5.	Elastic articulation - Tightening torque of the fixings - Visual inspection of the general condition (cracks, abnormal deformation)				1				1 1	
6.	Driving and idle wheels - Grease make up - Tightening torque of the fixings - Wear and tear inspection	4			1			6	1 2	
7.	Guiding wheels - Grease make up - Tightening torque of the fixings - Wear and tear inspection	4			1			6	1 1	

N°	Inspection	See Chap	After starting			Periodic maintenance				
			100	1000	M	100	1000	M	Y	L
8.	Hydraulic buffers <ul style="list-style-type: none"> - Tightening torque of the fixings - Visual inspection of the sealing : check outflow absence - Visual inspection of the axle : check cleanness axle 	4			1			6	1	
9.	Brushes <ul style="list-style-type: none"> - Fixings inspection - Wear and tear inspection : Minimal wear high : 30 mm - Cleaning 							3		
								3		
								3		
10.	Anti-collision system <ul style="list-style-type: none"> - Operating inspection and adjustment if necessary - Cleaning of the transmitter / receiver - Fixings inspection - Electrical connections 	7						3		
								3		
									1	
									1	

Figure 3 : End truck line

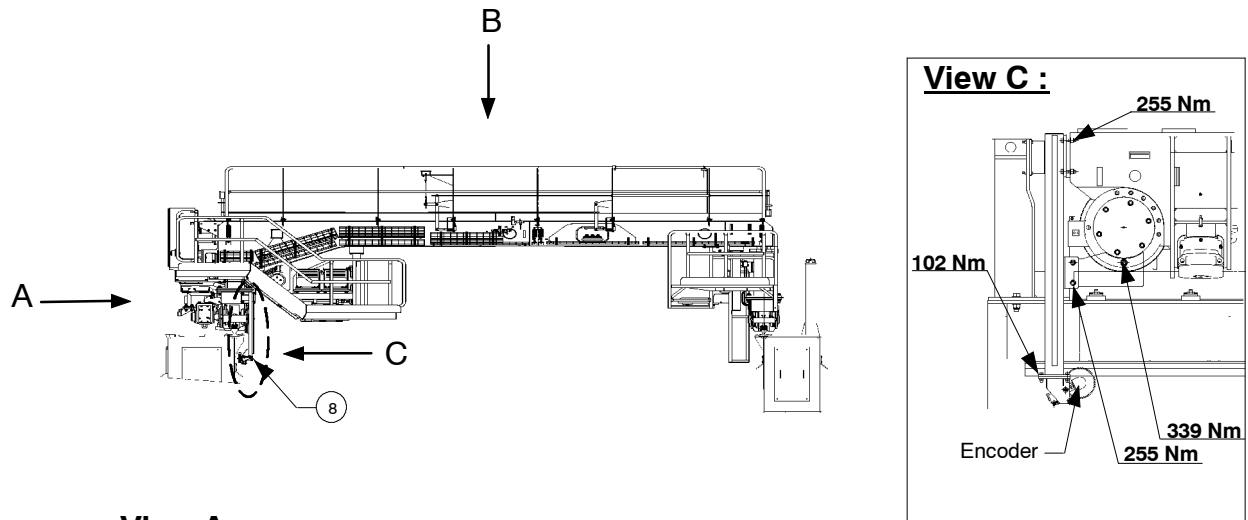


MA'ADEN

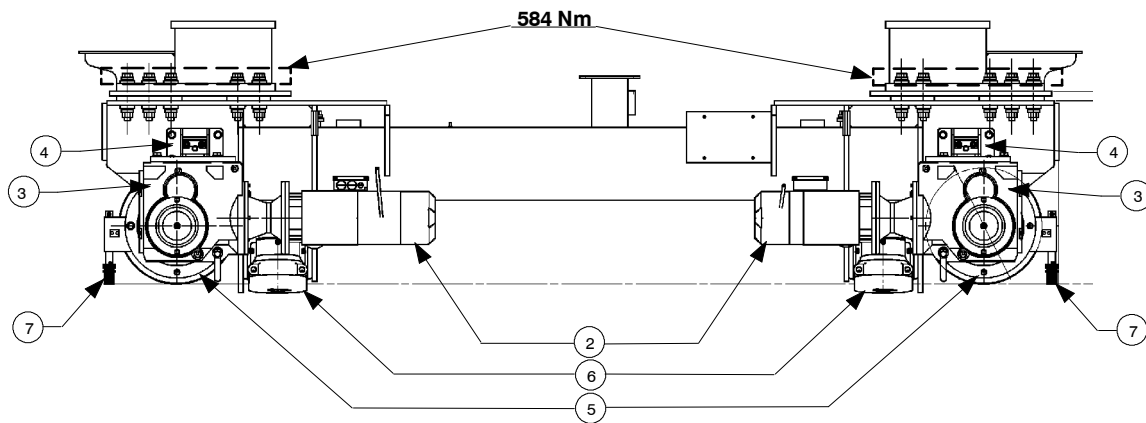
MAINTENANCE MANUAL OF THE POT TENDING MACHINE

N°	Inspection	See Chap	After starting			Periodic maintenance				
			100	1000	M	100	1000	M	Y	L
TENDING TROLLEY CROSS TRAVEL & FRAMEWORK										
MAINTENANCE NOTE : The maintenance of the reducer must be carried out from the main girder. (handrail removal can be necessary - use safety harness)										
1.	Main assembling - Tightening torque of the fixings - Dry cleaning - Visual inspection of general condition (cracks, abnormal deformation)	4			1 1			6	1 1	
2.	Motor Key recommendations (See supplier manual for more recommendations) - Inspect the brake : - Measure brake disc thickness - Brake disc, lining - Measure and set working air gap - Vacuum up the abraded matter - Inspect the motor : - Check anti-friction bearings and replace if necessary	7					10		1	
3.	Reducer Key recommendations (See supplier manual for more recommendations) - Check oil and oil level - Check running noise for possible bearing damage - Visually check the seals for leakage - Change oil - Replace anti-friction bearing grease - Fixing inspection - Visual inspection and cleaning of the vent plug	4	2		1		3 3 3		2 2 1	
4.	Elastic articulation - Tightening torque of the fixings - Visual inspection of the general condition (cracks, abnormal deformation)				1				1 1	
5.	Driving and idle wheels - Grease make up - Fixings inspection - Wear and tear inspection : wear = 5 mm maxi on radius	4			1			6	1 2	
6.	Guiding wheels - Grease make up - Fixings inspection - Wear and tear inspection : wear = 1,5 mm maxi on radius	4			1			6	1 1	
7.	Brushes - Fixings inspection - Wear and tear inspection : Minimal wear high : 30 mm - Cleaning							3 3 3		
8.	Resolving assembly - Fixings inspection - General inspection : Teeth wearing - Encoder : Operation test							3 3 3		

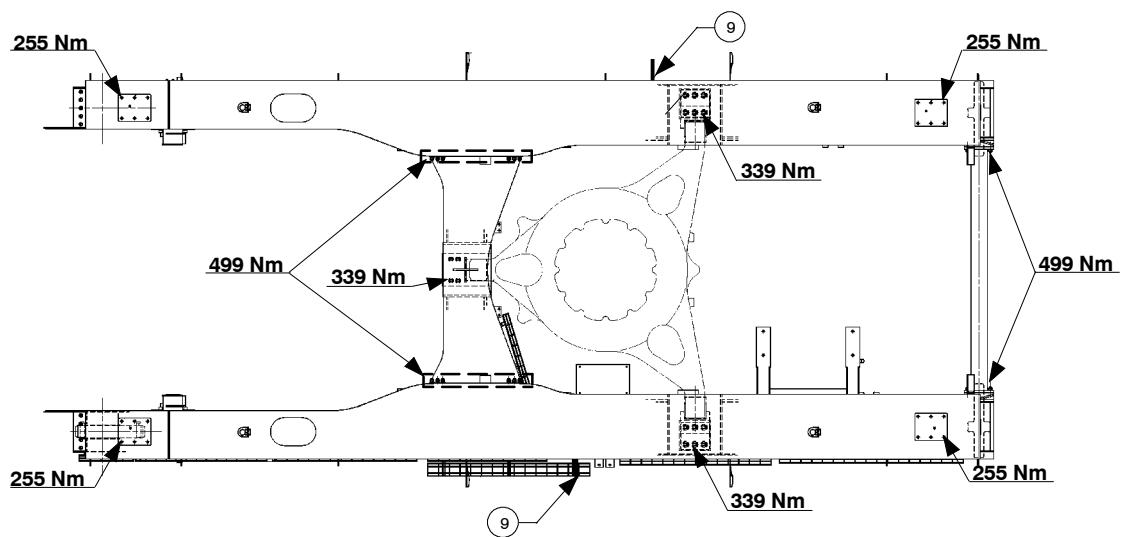
Figure 4 : Tending trolley cross travel & framework



View A :



View B :



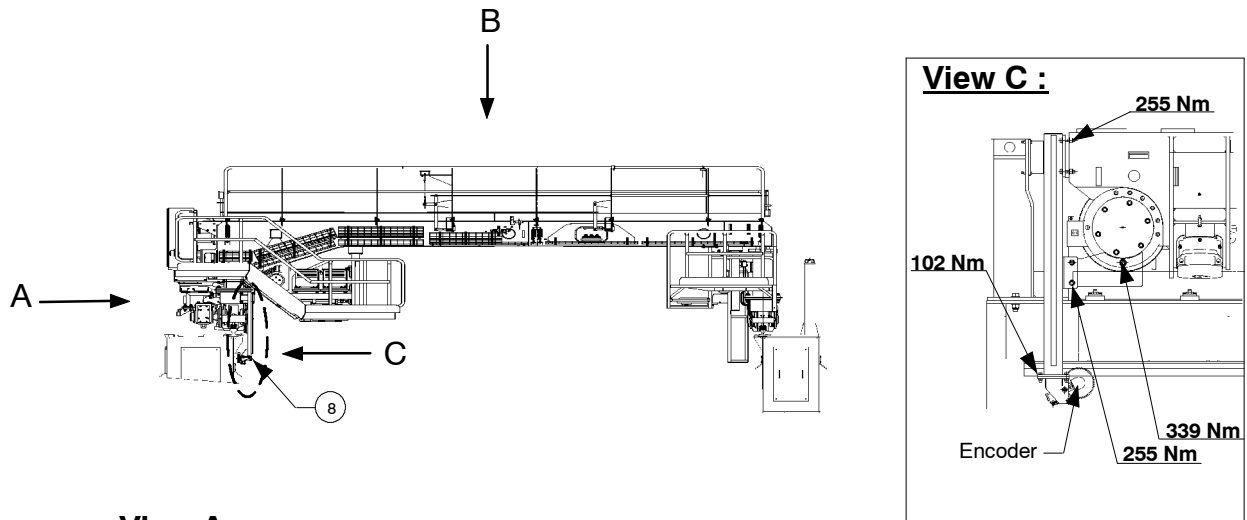
MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

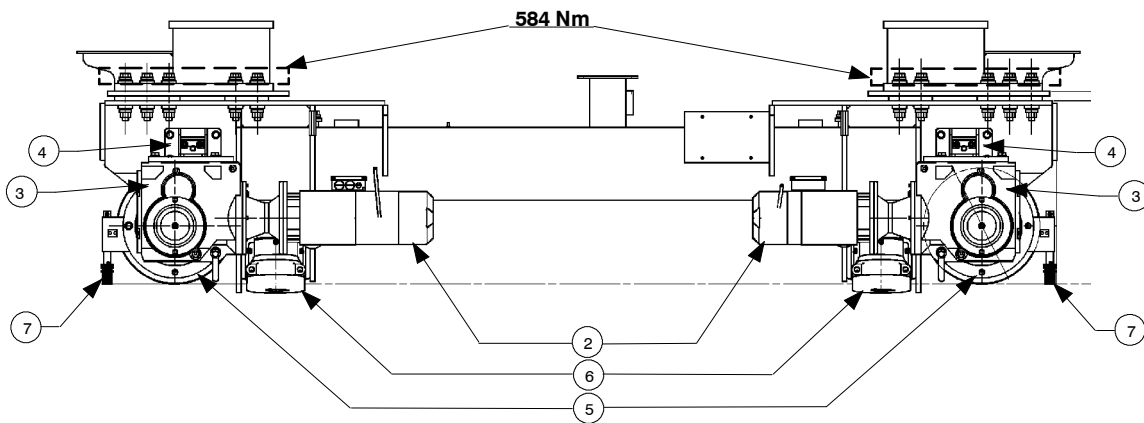
N°	Inspection	See Chap	After starting			Periodic maintenance				
			100	1000	M	100	1000	M	Y	L
9.	Proximity switches <ul style="list-style-type: none"> - Cleanness and operating inspection (Dry cleaning and gap adjustment) - Fixings inspection : check sensors can't move - Adjustment, electrical connections inspection 							3 6 6		



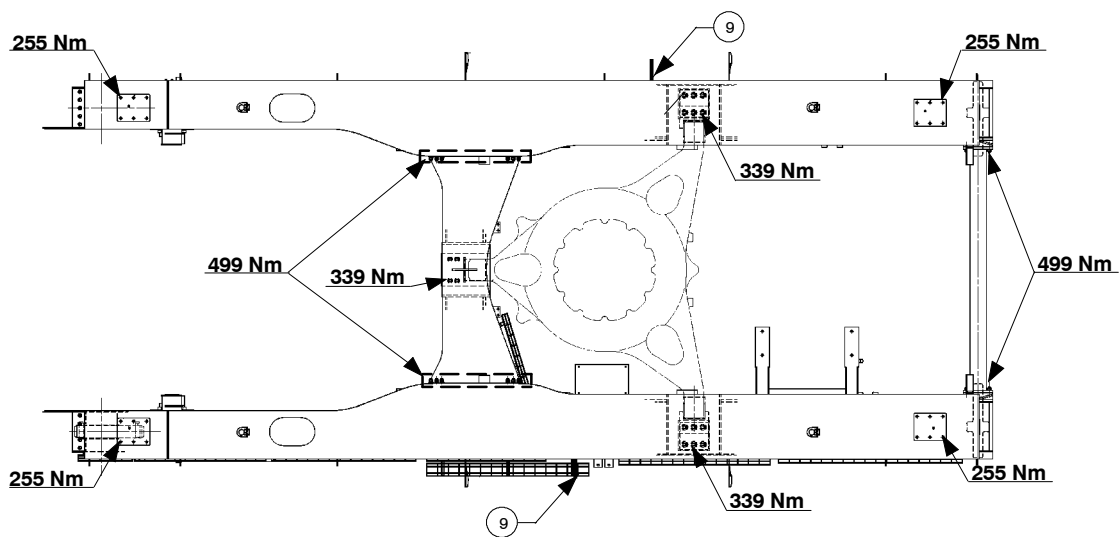
Figure 4 : Tending trolley cross travel & framework



View A :



View B :



MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

N°	Inspection	See Chap	After starting			Periodic maintenance				
			100	1000	M	100	1000	M	Y	L
TURRET ROTATION										
1.	Main assembling - Tightening torque of the fixings - Visual inspection of general condition (cracks, abnormal deformation) - Dry cleaning	4			1 1			3	1 1	
2.	Motor - No particular maintenance. See supplier manual.	7								X
3.	Reducer - Oil level inspection - Oil changing - Visually check the seals for leakage - Tightening torque of the fixings - Inspection at starting and in operation (noise level)	4	1		1		3	1 3 3	1	
4.	Slewing gear (See supplier manual for more recommendations) - Greasing - Fixings inspection - Visual inspection of seals (cracks, abnormal deformation, wear and tear of friction lip) - Replace fixings	4			1	1	14		1	
5.	Turret rotation mechanism - Oil level and tightness inspection - Oil changing of the tank / baffle - Breather replacement : 0-03-327-16 - Visual inspection of the sealing - Fixings inspection - Inspection at starting and in operation (noise level)	4			1 1			6 3 6	1 1	
6.	Limit switch, proximity switches & encoder - Cleanness and operating inspection (Dry cleaning and gap adjustment) - Fixings inspection : check sensors can't move - Adjustment, electrical connections inspection							3 6 6		
7.	Electric and pneumatic cable - Visual inspection of general condition (cracks, abnormal deformation)				1				1	

Figure 5a : Turret rotation

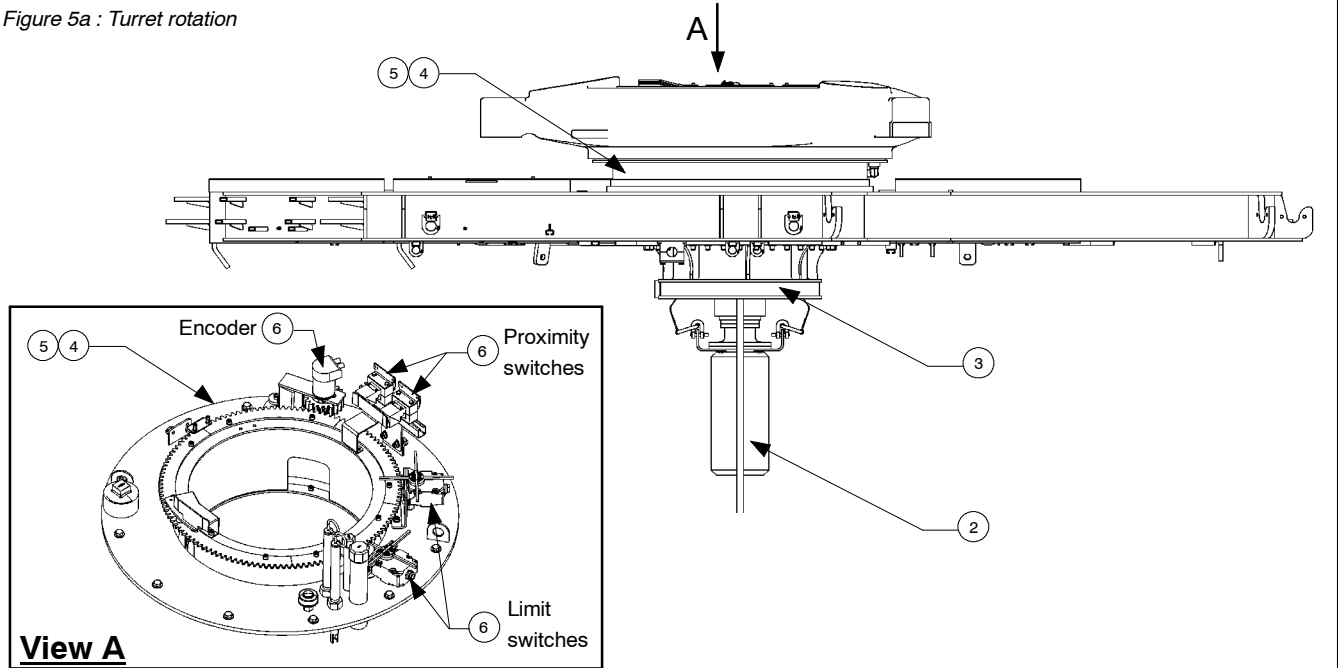


Figure 5b

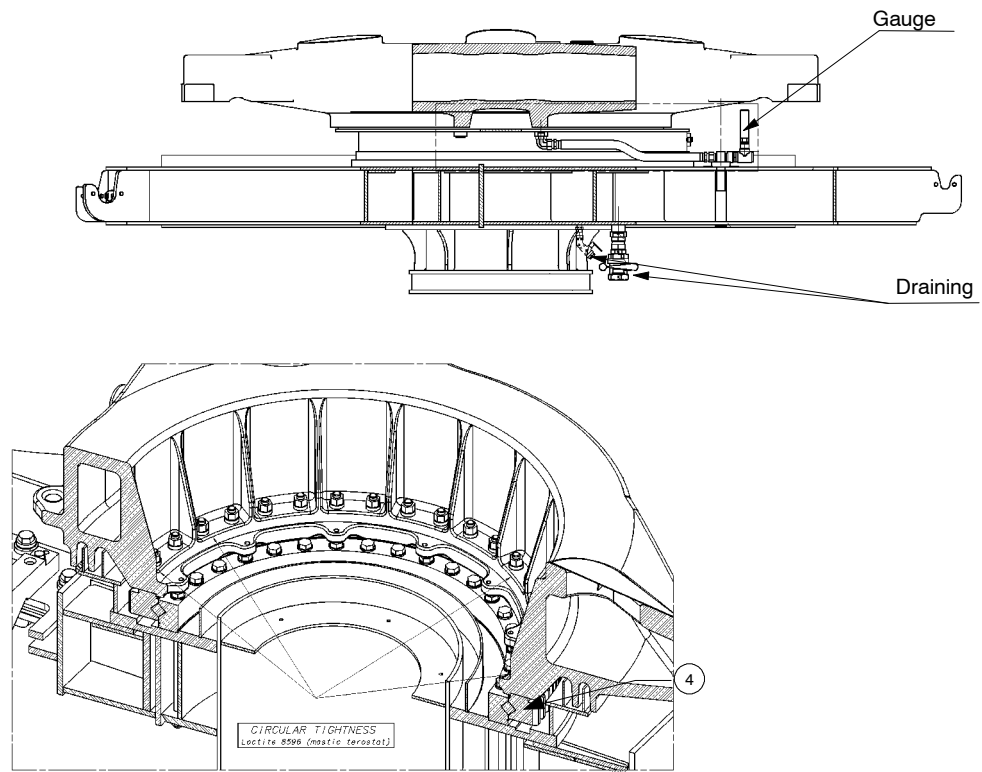
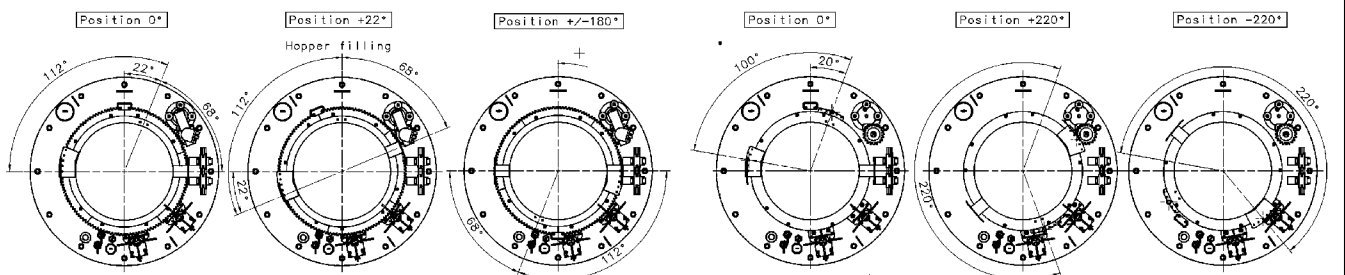


Figure 5c

TURRET POSITIONING ASS'Y

TURRET OVERSTROKES ASS'Y

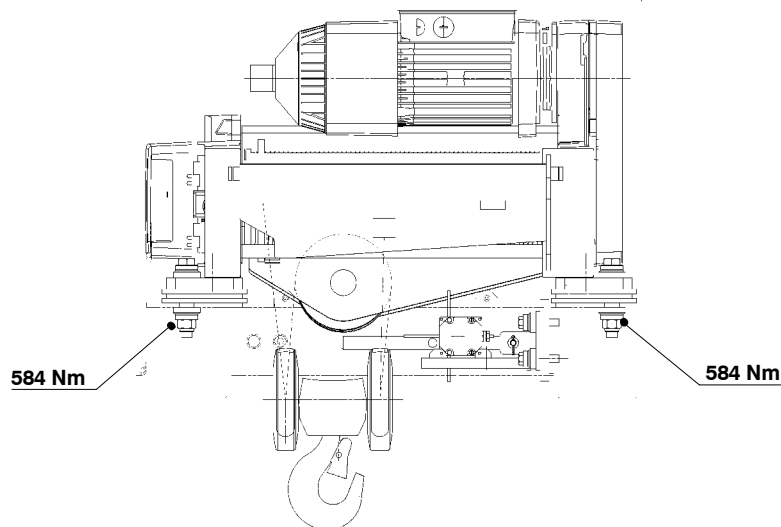


MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

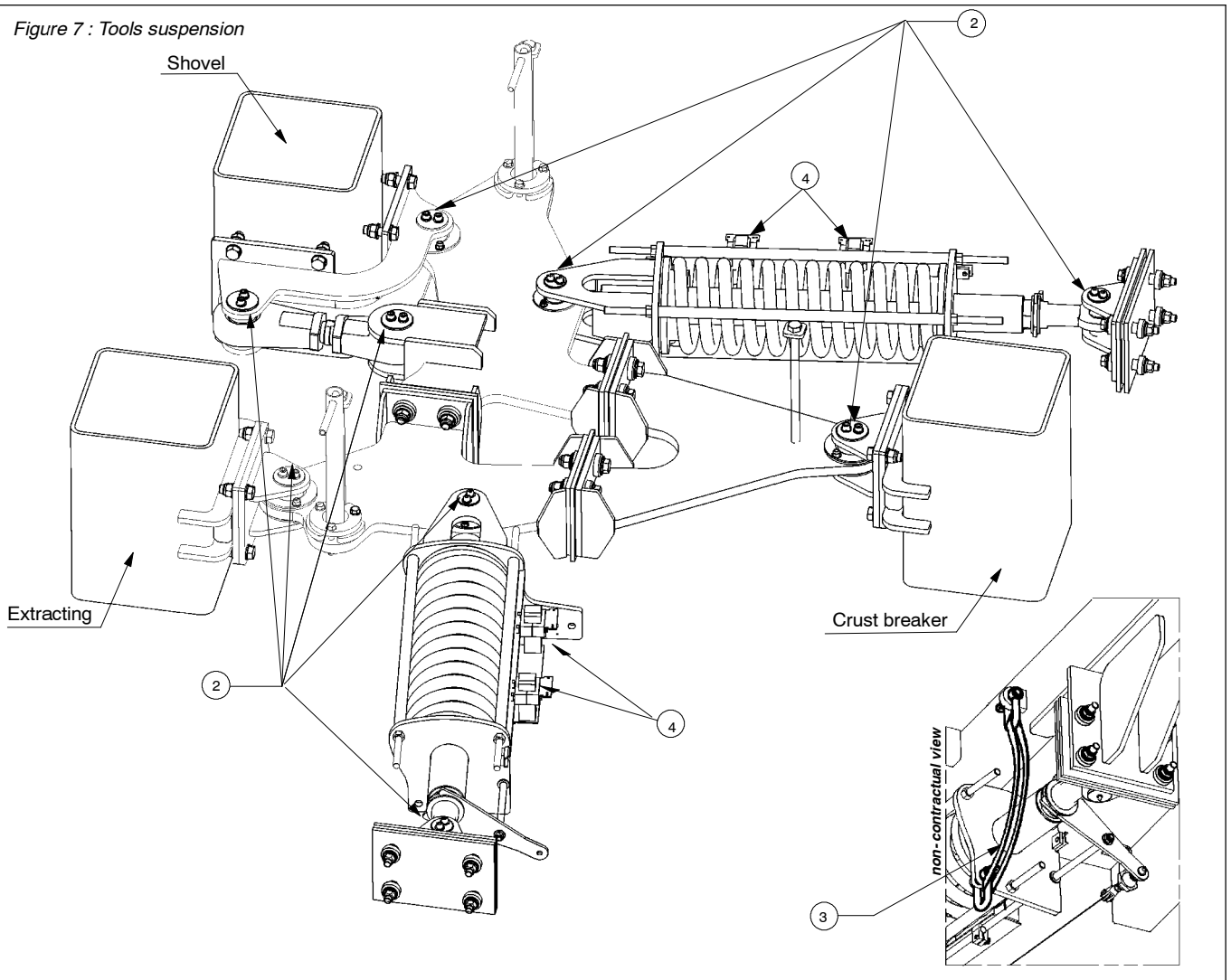
N°	Inspection	See Chap	After starting			Periodic maintenance				
			100	1000	M	100	1000	M	Y	L
5MT HOIST ASSEMBLY										
1.	Main assembling - Tightening torque of the fixings - Visual inspection of general condition (cracks, abnormal deformation) - Dry cleaning	4			1 1			3	1 1	
2.	Hoist unit Key recommendations (See supplier manual for more recommendations) - Oil level inspection changing - Oil changing - Check safety equipment : - Brake - Hoist limit switch - Emergency stop, crane switch - Overload cut-off - Disconnecting switch and main isolator - Check mechanical components : - Load hook (cracks, cold deformation, wear) - Rope - Rope anchorage - Rope guide - Drive parts (gearing, wheel flanges, etc.) - Bolt connections, welds - End stops, buffers - Check electrical components : - Power supply cable - Switching functions	9			1 1 1			1	1 1 1	
3.	Lifting cables • Lubricate rope ----- - Check rope for damage and broken wires - Wedge box inspection : - Check cracks absence by penetrant inspection - Check the length of cable without load = 150 mm mini	4			1			6 3 3 3		

Figure 6 : 5MT Hoist unit



N°	Inspection	See Chap	100	1000	M	100	1000	M	Y	L
TOOLS SUSPENSION										
MAINTENANCE NOTE : For the dismantling of the tools suspension device, use anchor points under turret platform and sufficient lifting means to handle suspension spring and use a lifting platform for the access. For the access when inspection of tools suspension device, there are removable panels on the circular platform. Ensure that operator use safety harness and anchor points. It is recommended to use a lifting platform to access to the suspension device for the shafts lubricating.										
1.	Main assembling - Visual inspection of general condition (cracks, abnormal deformation) - Check prestressed spring = 650mm - Dry cleaning	4			1				1	
					1				1	
									3	
2.	Articulations (x9) - Grease make up							3		
3.	Safety straps (x4) - Visual inspection							3		
4.	Proximity switches - Cleanness and operating inspection (Dry cleaning and gap adjustment) - Fixings inspection : check sensors can't move							3		
								6		

Figure 7 : Tools suspension



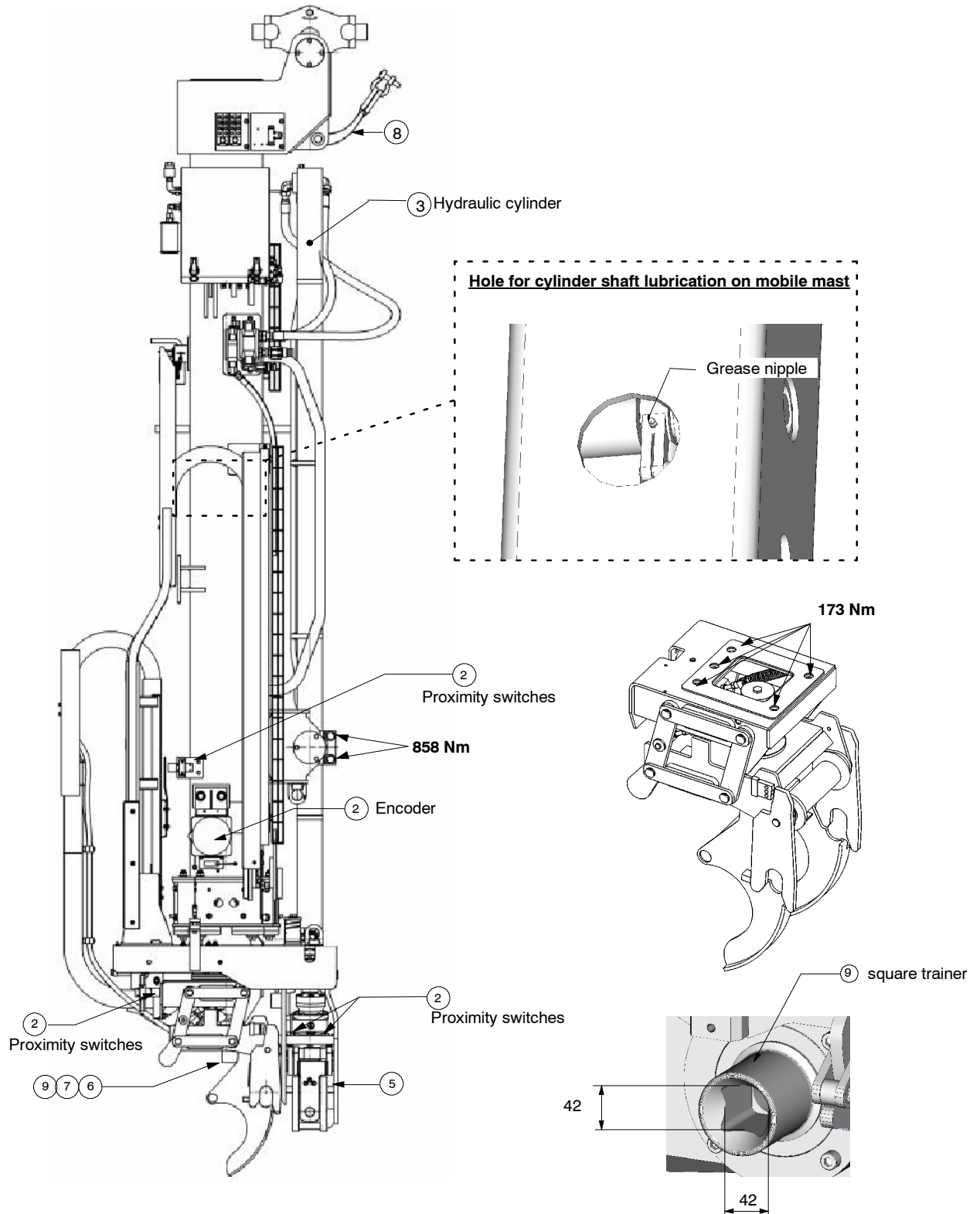
MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

N°	Inspection	See Chap	After starting			Periodic maintenance				
			100	1000	M	100	1000	M	Y	L
EXTRACTING AND TIGHTENING MECHANISM										
MAINTENANCE NOTE : For the tool removal, use anchorage points in the middle of the upper platform (disassemble the connection to the suspension device with lifting platform + disconnect all energies). To go down the extracting tool use the specific maintenance trailer 1-10-957-06)										
1.	Main assemblings - Tightening torque of the fixings - Visual inspection of general condition (cracks, abnormal deformation) - Dry cleaning	4			1 1			3	1 1	
2.	Proximity switches & encoders - Cleanness and operating inspection (Dry cleaning and gap adjustment) - Fixings inspection : check sensors can't move - Adjustment, electrical connections inspection						3 6 6			
Extracting mechanism										
3.	Hydraulic cylinder - Tightness of cylinder, pipe and hoses - Operating inspection (speed, stroke, ...) - Visually check the seals for leakage - Grease make up	5					3 3 3 3			
4.	Pneumatic cylinder (extracting clamp) - Tightness of cylinder, pipe and hoses - Operating inspection (speed, stroke, ...) - Visually check the seals for leakage - Grease make up	6					3 3 3 3			
5.	Extracting clamp - Visual inspection of general condition (cracks, abnormal deformation) - Check there is no crack on body by penetrant test - Wear and tear of clamping catch - Articulations (all fulcrum pins shall be greased)						3 3 3	1		
Tightening mechanism										
6.	Hydraulic motor (See hydraulic motor supplier manual) - Fixings inspection - Visual inspection of the tightness of motor (pipes, hoses) - Hydraulic motor operating inspection (tightening torque 340 Nm) - Wear and tear inspection of the tightening square - Grease make up of cam clip	5			1		3 3 3	1 1		
7.	Pneumatic cylinder (Tightening device) - Tightness of cylinder, pipe and hoses - Operating inspection (speed, stroke, ...) - Visually check the seals for leakage - Grease make up	6					3 3 3 3			

8.	Safety strap - Visual inspection							3		
9.	Square trainer - Visual inspection of general condition (cracks, abnormal deformation)							3		

Figure 8 : Extracting and tightening mechanism

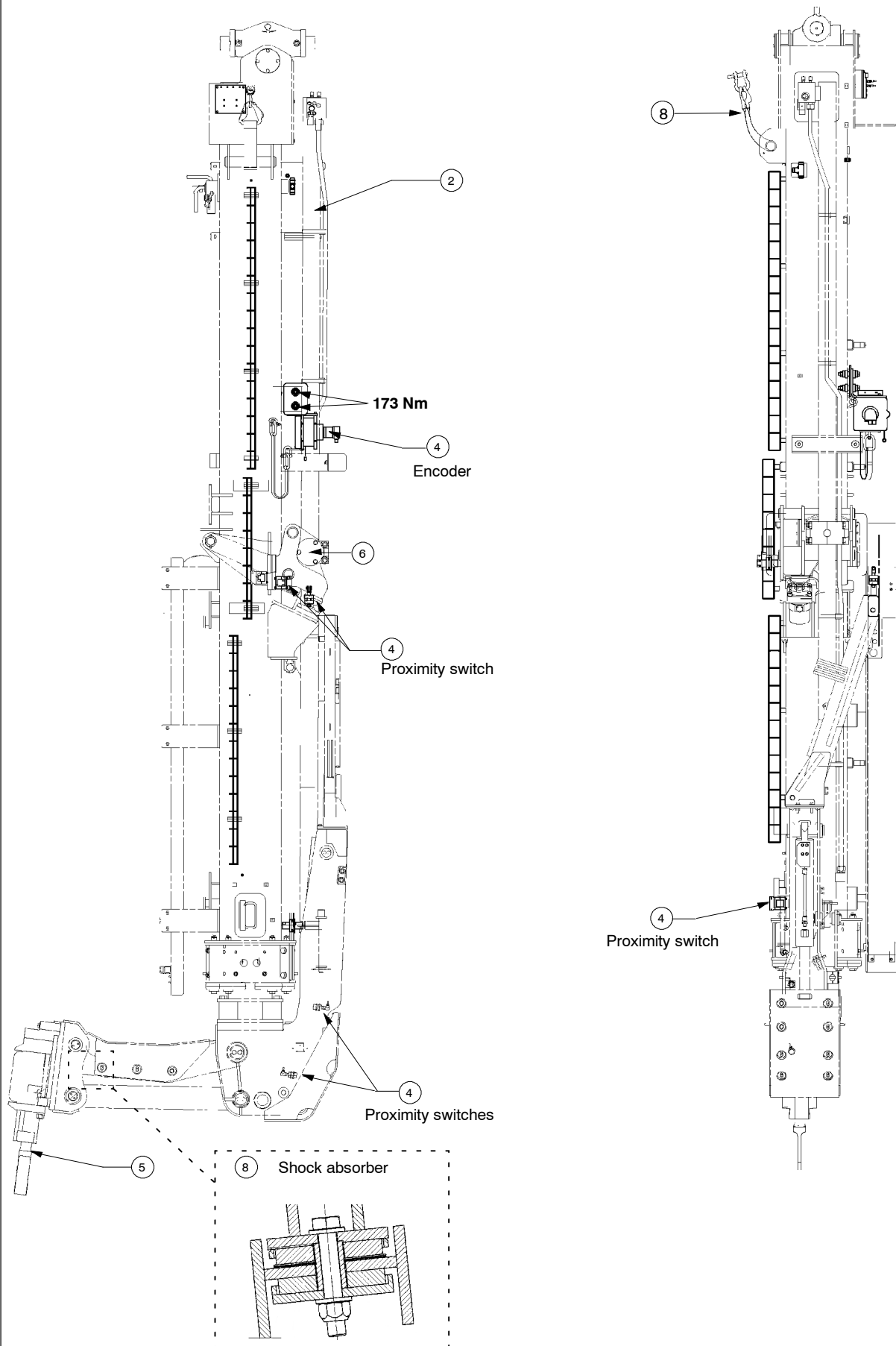


MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

N°	Inspection	See Chap	After starting			Periodic maintenance				
			100	1000	M	100	1000	M	Y	L
CRUST BREAKING MECHANISM										
<i>MAINTENANCE NOTE :</i> For the tool removal, use anchorage points in the middle of the upper platform (disassemble the connection to the suspension device with lifting platform + disconnect all energies). To go down the extracting tool use the specific maintenance trailer 1-10-957-07)										
1.	Main assembling - Tightening torque of the fixings - Visual inspection of general condition (cracks, abnormal deformation) - Dry cleaning	4			1 1			6 3	1	
2.	Hydraulic cylinder - Tightness of cylinder, pipe and hoses - Operating inspection (speed, stroke, ...) - Visually check the seals for leakage - Grease make up	5						3 3 3 3		
3.	Rod equiped low part - Grease make up							3		
4.	Proximity switches & encoder - Cleanness and operating inspection (Dry cleaning and gap adjustment) - Fixings inspection : check sensors can't move - Adjustment, electrical connections inspection							3 6 6		
5.	Crustbreaker See supplier manual - Fixings inspection - Visual inspection of the breaker : cylinder, piston, impact part (abnormal deformation) - Wear and tear inspection of the breaker tip - Air supply hose and operating inspection - Breaker tip fixing inspection	4			1		1	3 1 6	1	
6.	Oiler - Oil level inspection every day - Check correct circuit lubrication : 4 to 6 drops / minute					Daily				
7.	Safety strap - Visual inspection							3		
8.	Shock absorber - Wear and tear inspection (cracks, abnormal deformation)							3		

Figure 9 : Breaking mechanism

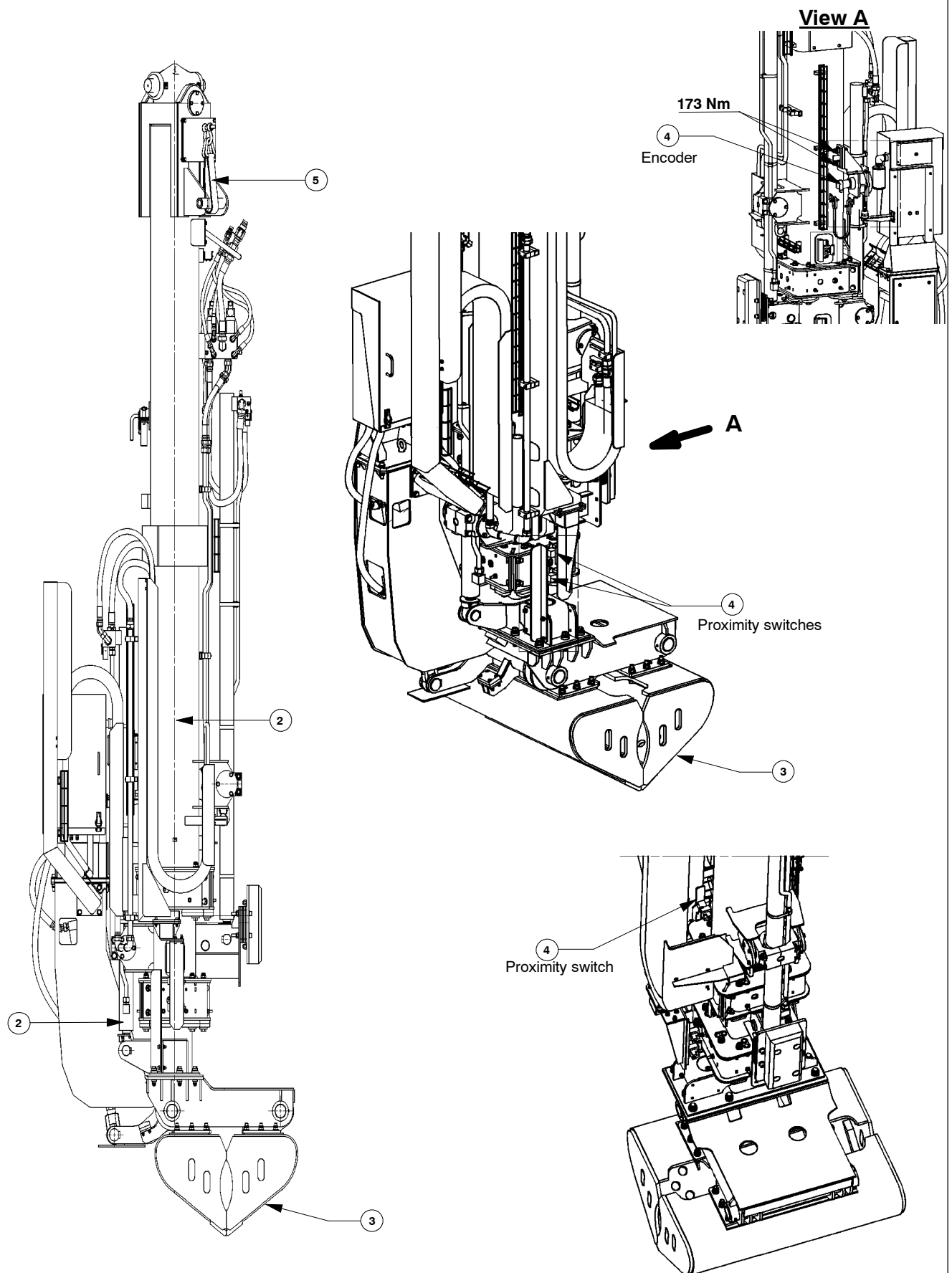


MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

N°	Inspection	See Chap	After starting			Periodic maintenance				
			100	1000	M	100	1000	M	Y	L
CLEANING SHOVEL										
<i>MAINTENANCE NOTE :</i> For the tool removal, use anchorage points in the middle of the upper platform (disassemble the connection to the suspension device with lifting platform + disconnect all energies). To go down the extracting tool use the specific maintenance trailer 1-10-957-05)										
1.	Main assembling - Tightening torque of the fixings - Visual inspection of general condition (cracks, abnormal deformation) - Dry cleaning	4			1 1			3	1 1	
2.	Hydraulic cylinders - Tightness of cylinder, pipe and hoses - Operating inspection (speed, stroke, ...) - Visually check the seals for leakage - Grease make up	5						3 3 3 3		
3.	Buckets - Fixings inspection - Visual inspection of general condition (cracks, abnormal deformation) - Operating inspection (speed, stroke, ...) - Articulations				1			3 3 3 3		
4.	Proximity switches & encoder - Cleanness and operating inspection (Dry cleaning and gap adjustment) - Fixings inspection : check sensors can't move - Adjustment, electrical connections inspection							3 6 6		
5.	Safety strap - Visual inspection							3		

Figure 10 : Cleaning shovel



MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

N°	Inspection	See Chap	After starting			Periodic maintenance				
			100	1000	M	100	1000	M	Y	L
ALUMINA FEEDING DISCHARGE HOPPER										
1.	Main assembling - Tightening torque of the fixings - Visual inspection of general condition (cracks, abnormal deformation) - Dry cleaning	4			1 1			3	1 1	
2.	Proximity switches & encoder - Cleanness and operating inspection (Dry cleaning and gap) - Fixings inspection : check sensors can't move - Adjustment, electrical connections inspection						3 6 6			
DISCHARGE MECHANISM										
3.	Lock valve assembly - Tightness of cylinder, pipes and hose - Visually check the seals for leakage - Operating inspection (speed, stroke, ...)						3 3 3			
4.	Rotation mechanism - Slew drive - Check mounting screw - Check the tilting clearance - Check oil level - Change oil - Grease slew drive	4			1	7	6 3 3	1		
5.	Rotation mechanism - Motor Key recommendations (See supplier manual for more recommendations) - Check anti-friction bearings and replace if necessary - Replace the oil seal	7					10 10			
6.	Rotation mechanism - Reducer Key recommendations (See supplier manual for more recommendations) - Check oil and oil level - Check running noise for possible bearing damage - Visually check the seals for leakage - Change oil - Replace anti-friction bearing grease - Fixing inspection - Visual inspection and cleaning of the vent plug	4	2		1		3 3 3	2 2 1 3		
7.	Silent bloc - Wear and tear inspection (maximum length stressed = 19 mm)								1	
8.	Conical thrust - Wear and tear inspection (maximum length stressed = 32 mm)								1	
9.	Seal - Visually check the seal for leakage								1	
10.	Alumina distribution hose - Visual inspection of general condition (cracks, abnormal deformation)								1	

Figure 11a : Alumina feeding and discharge hopper

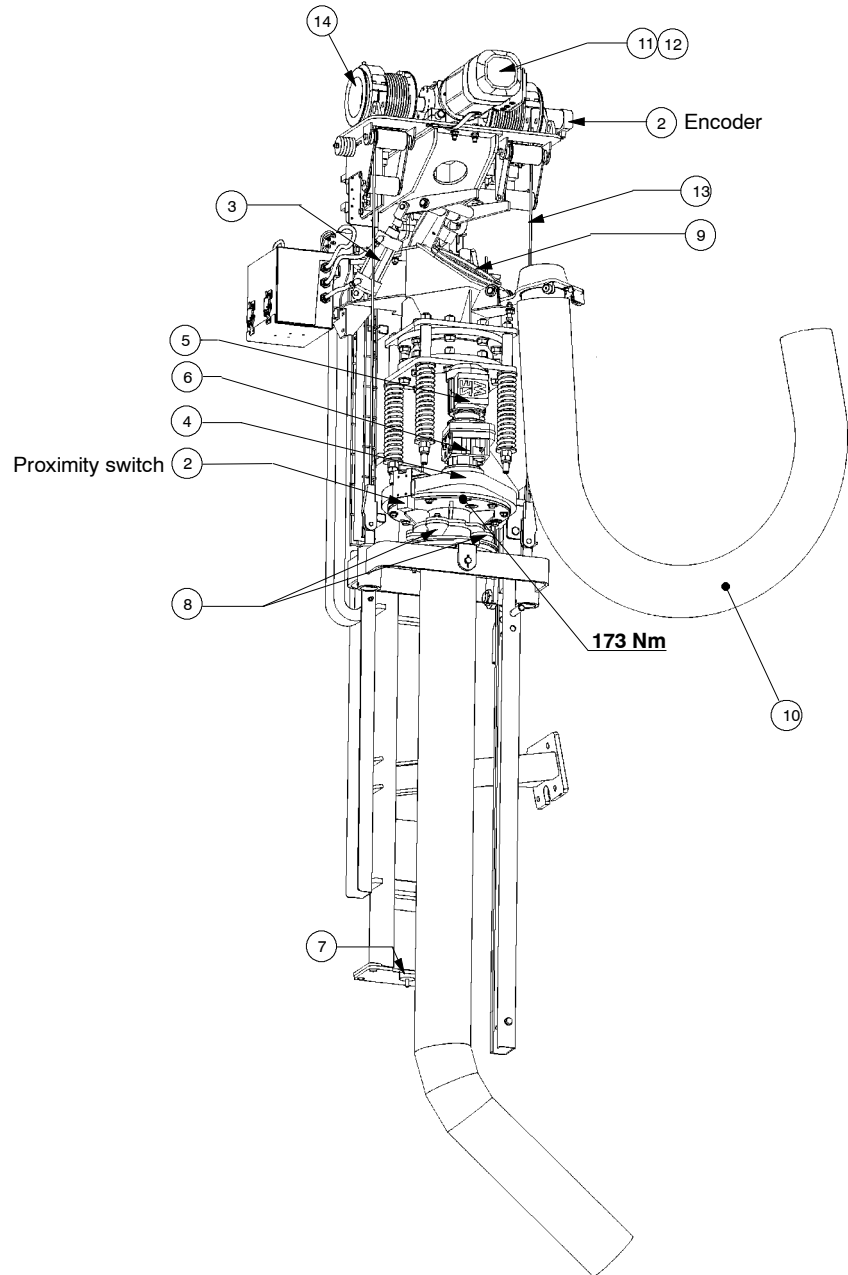
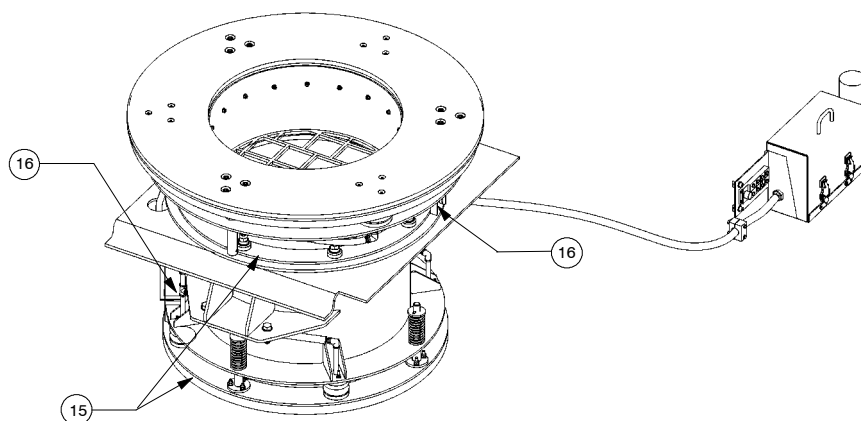


Figure 11b : Hopper filling device



N°	Inspection	See Chap	After starting			Periodic maintenance				
			100	1000	M	100	1000	M	Y	L
11.	Lifting mechanism - Motor Key recommendations (See supplier manual for more recommendations) - Inspect the brake : - Measure brake disc thickness (9 mm mini) - Brake disc, lining - Measure and set working air gap (0.25 to 0.6 mm) - Pressure plate - Vacuum up the abraded matter - Inspect the motor : - Check anti-friction bearings and replace if necessary - Replace the oil seal	7					10		1	
12.	Lifting mechanism - Reducer Key recommendations (See supplier manual for more recommendations) - Check oil and oil level - Check running noise for possible bearing damage - Visually check the seals for leakage - Change oil - Replace anti-friction bearing grease - Fixing inspection - Visual inspection and cleaning of the vent plug	4	2		1		3 3 3		2 2 1	
13.	Lifting cables • Lubricate rope ----- - Check rope for damage and broken wires - Wedge box inspection : - Check cracks absence by penetrant inspection - Check the length of cable without load = 150 mm mini	4			1			6 3 3 3		
14.	Drum • Grease make up of the drum bearing ----- - Inspection of the correct winding - Wedge box inspection : - Check cracks absence by penetrant inspection - Check the length of cable without load = 150 mm mini - Visual inspection of general condition (cracks, abnormal deformation) - Check rope securing devices and play of rope guide on drum	4						3 3 3 3 6	1	
HOPPER FILLING DEVICE										
15.	Seal - Visually check the seal for leakage								1	
16.	Proximity switches - Cleanness and operating inspection (Dry cleaning and gap) - Fixings inspection : check sensors can't move - Adjustment, electrical connections inspection							3 6 6		

Figure 11a : Alumina feeding and discharge hopper

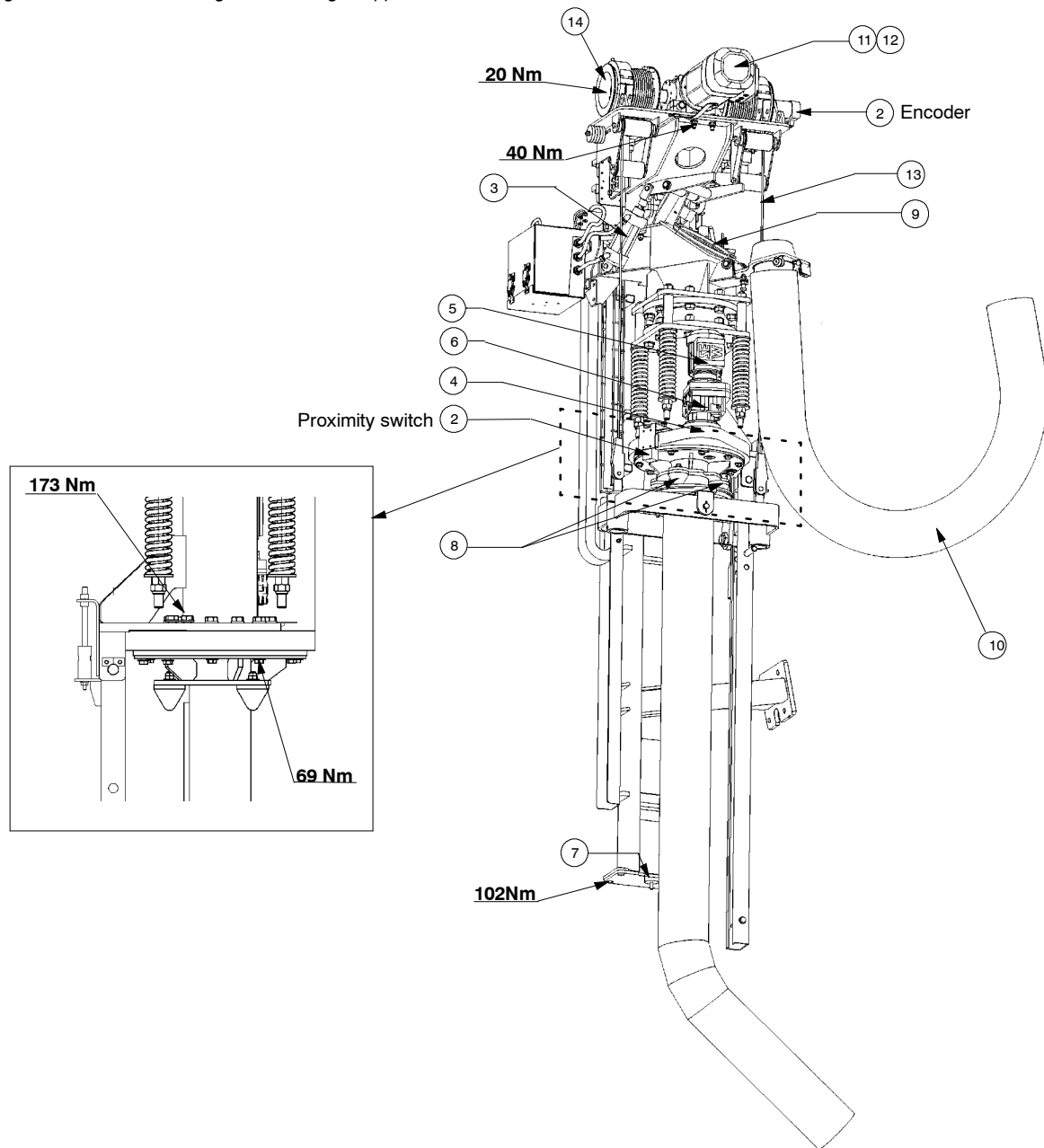
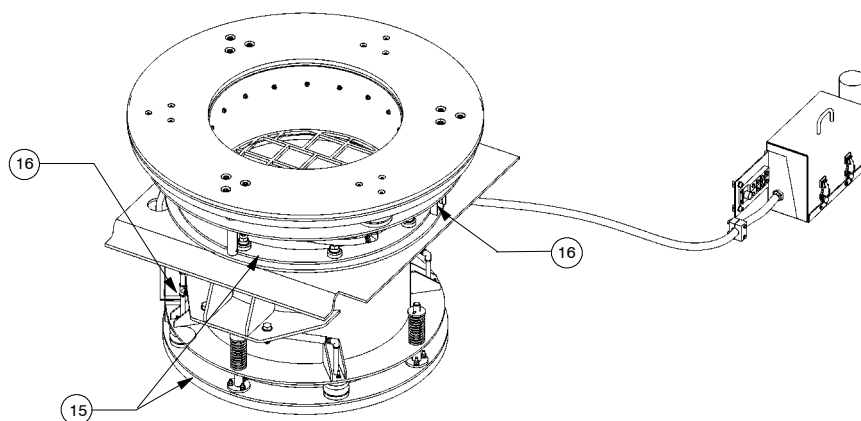


Figure 11b : Hopper filling device

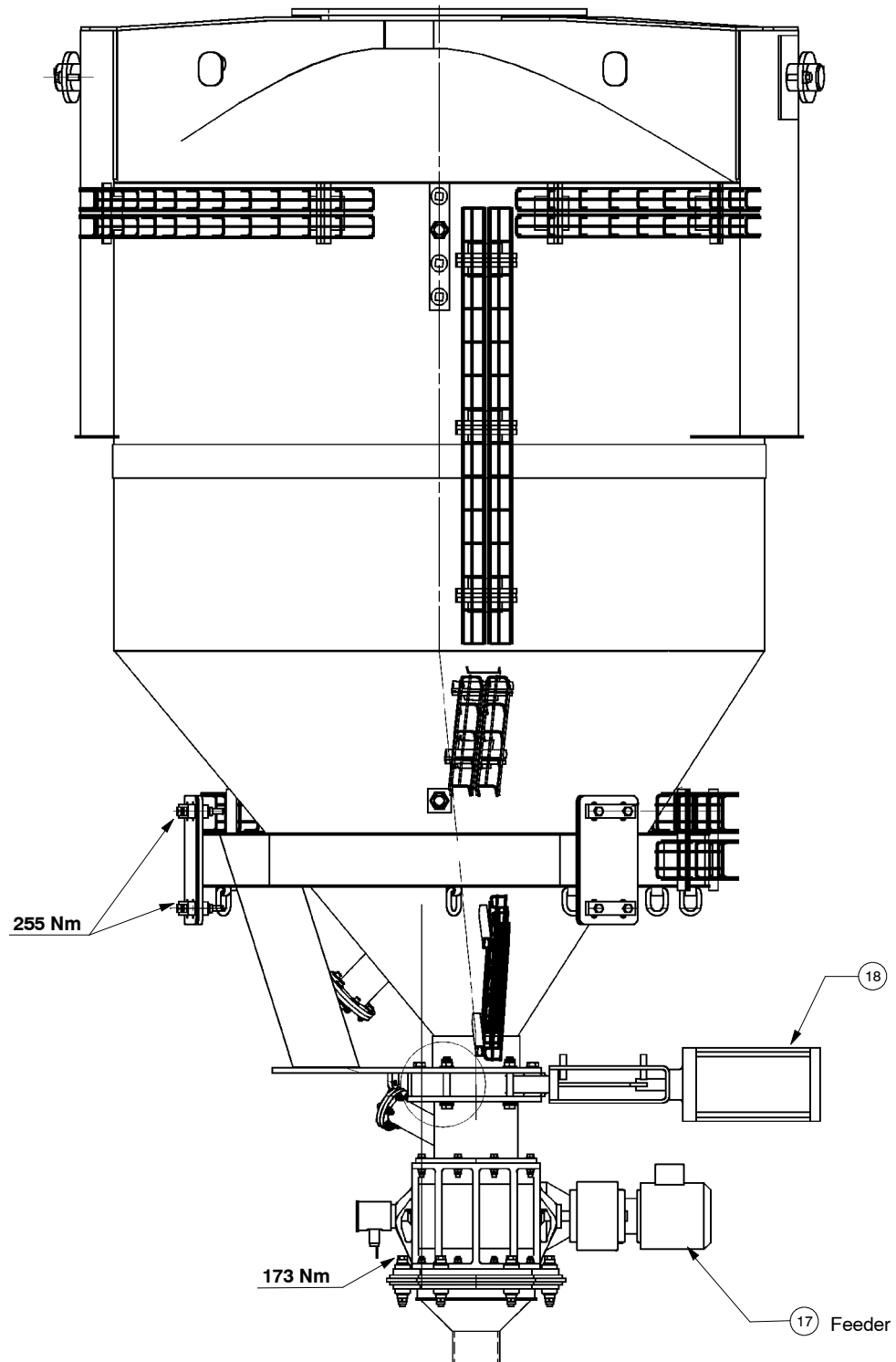


MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

N°	Inspection	See Chap	After starting			Periodic maintenance				
			100	1000	M	100	1000	M	Y	L
ANODE COVERING FEEDING										
17.	Feeder									
	- Oil level inspection							3		
	- Oil changing				1				1	
	- Visual inspection of the sealing							3		
	- Fixings inspection				1				1	
	- Inspection at starting and in operation (noise level)				1			3		
	- Grease make up of the bearings							3		
18.	Sliding valve assembly									
	- Tightness of cylinder, pipes and hose							3		
	- Operating inspection (speed, stroke, ...)							3		
	- Electrical connections							3		

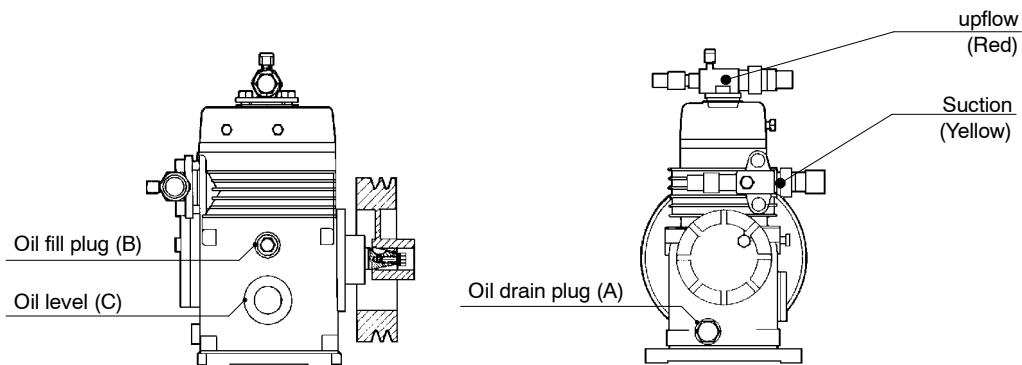
Figure 11c : Anode covering feeding



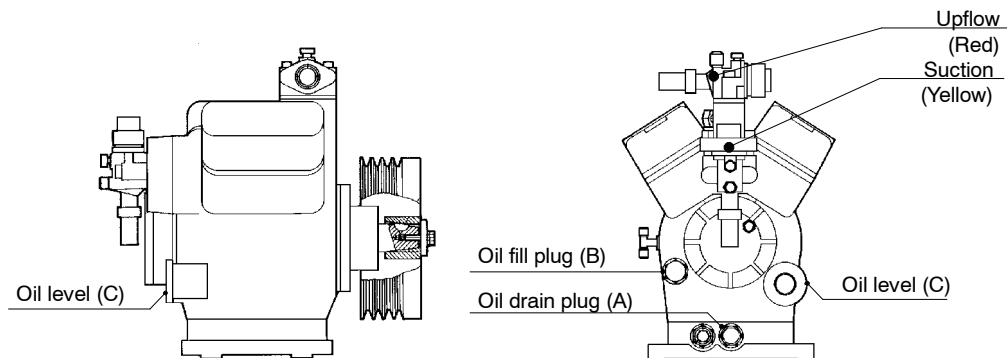
N°	Inspection	See Chap	After starting			Periodic maintenance				
			100	1000	M	100	1000	M	Y	L
AIR CONDITIONING UNIT AND COOLING SYSTEM										
1.	Compressors (F3, F4 & F5) (See chapter "Air conditioning units" for more recommendations) - Check : - Compressor leaks - Oil level - Running noise - Pressures - Temperatures - Fonctioning of the additional equipment - Oil changing	8			1				1	
			2						1	
2.	Refrigerant circuit - Inspection of the refrigerant circuit (no leakage)	8						1		

Figure 12 : Air conditionning unit

BOCK F3



BOCK F4



BOCK F5

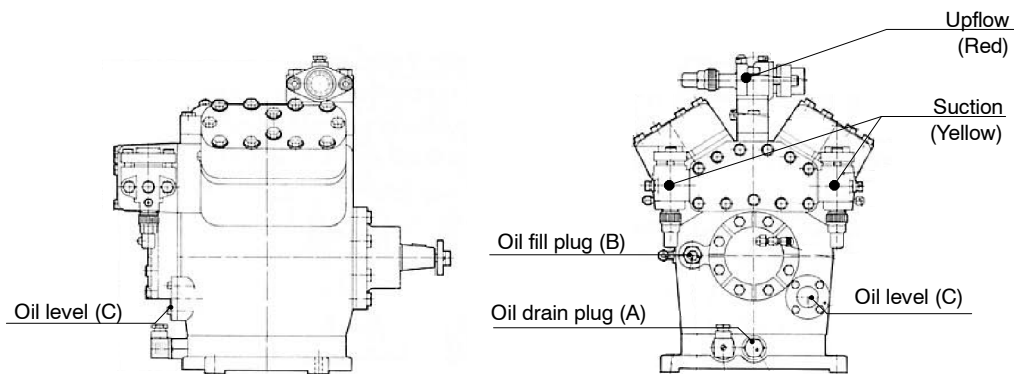
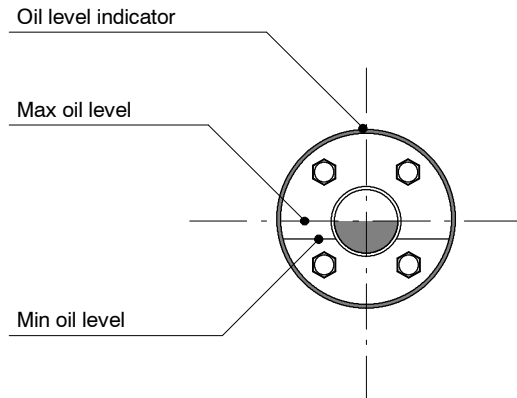
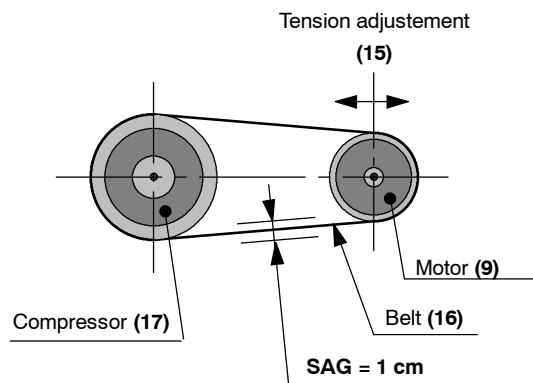


Figure 13 : Oil level & Frigoric gas visual control - See instructions in chapter "Air conditioning unit"

Oil level indicator

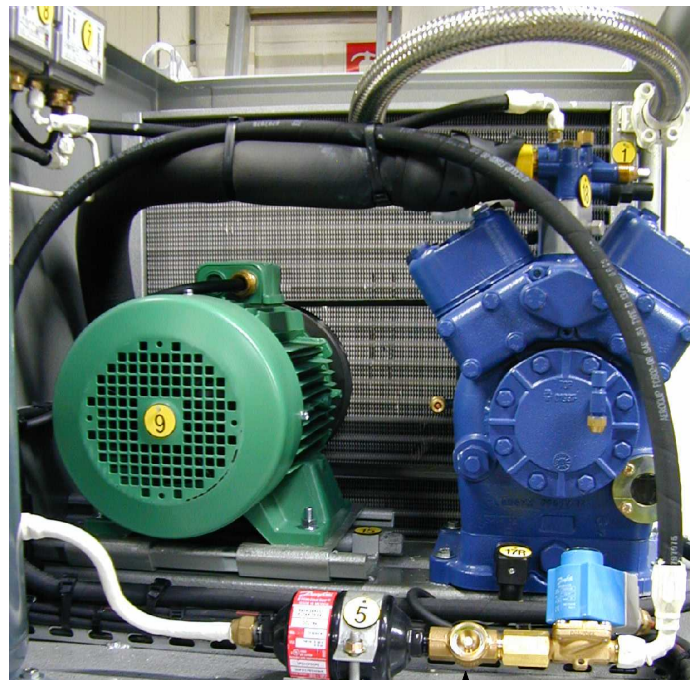
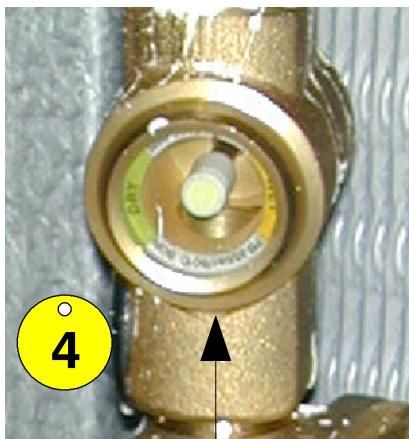


Belt tensioning



EXAMPLE OF ELEMENTS LOCATION

Frigoric gas R227 level indicator

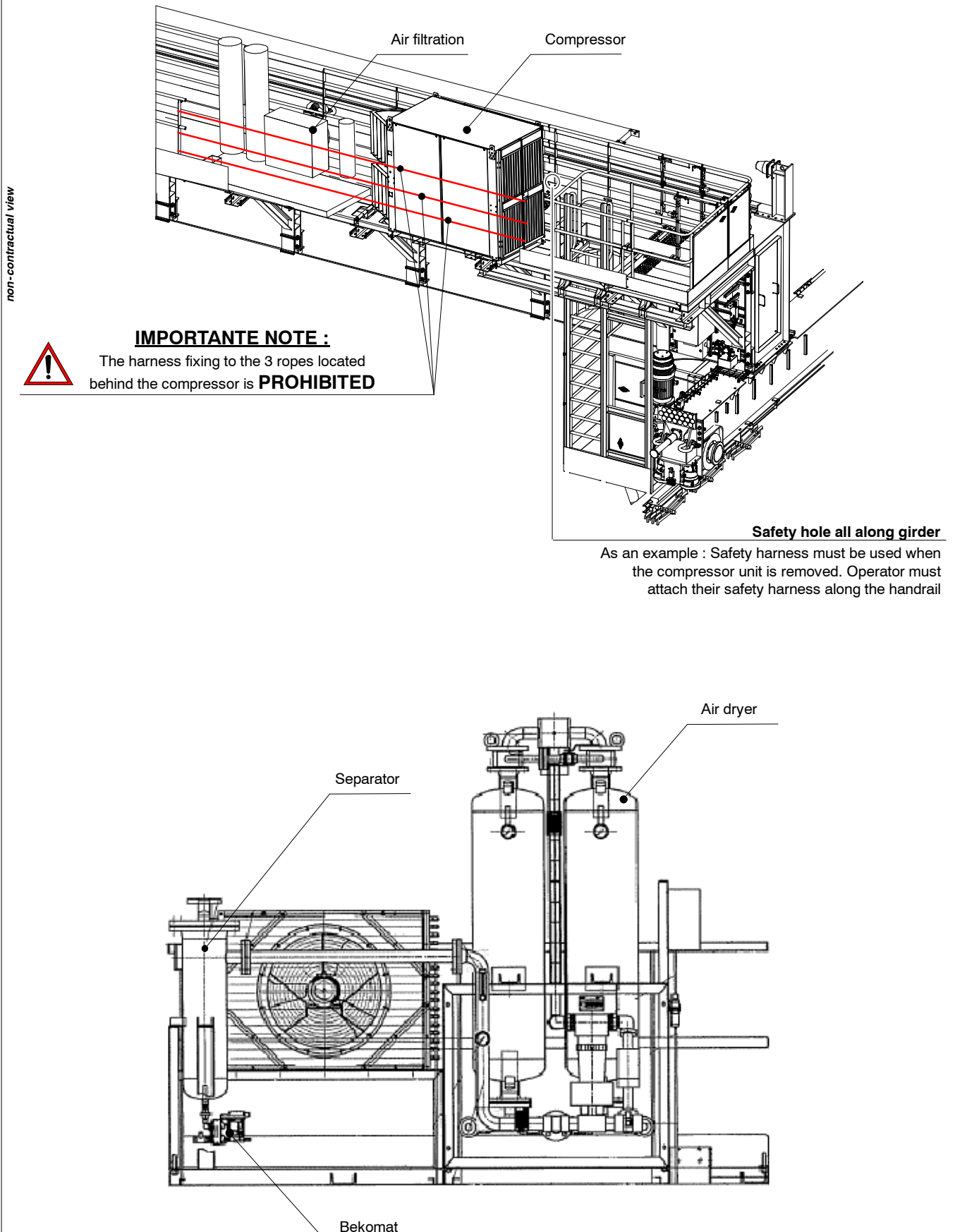


MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

N°	Inspection	See Chap	After starting			Periodic maintenance				
			100	1000	M	100	1000	M	Y	L
COMPRESSOR										
1.	Compressor - See chapter "Pneumatic maintenance"	6								
AIR DRIER										
2.	See Chapter "Pneumatic maintenance" - Check the cycle running - Check the draining electro valves tightness when the corresponding columns are under pressure - Check the distributor check-valves tightness. - Check the running parameters (pressure, etc.) - Check the filters set up or down dryer - Check the state of draining electro valves - Replace the gaskets of distributor check-valves - Check the control box : terminals screwing up - Replace the desiccant						1 1 1 1 1	1 1 1 2		
E.C.L AIR FILTRATION										
3.	See supplier manuals for more recommendations Separator : - Check the coalescer plug is always clean - Buffer replacement of separator- Separator kit code : 1-11-044-16 - See Chapter "Pneumatic maintenance" Column : - Check thickness by appropriate means (ultrasound, etc.) Minimum thickness for cylindrical part = 2,0 mm Minimum thickness for tank bottoms = 2,5 mm - Fixings inspection Bekomat : - Clean housing and valve - Replace wearing parts	6			1 3		3 3	2 1 1		

Figure 14 : Compressor and air filtration (air dryer & separator)

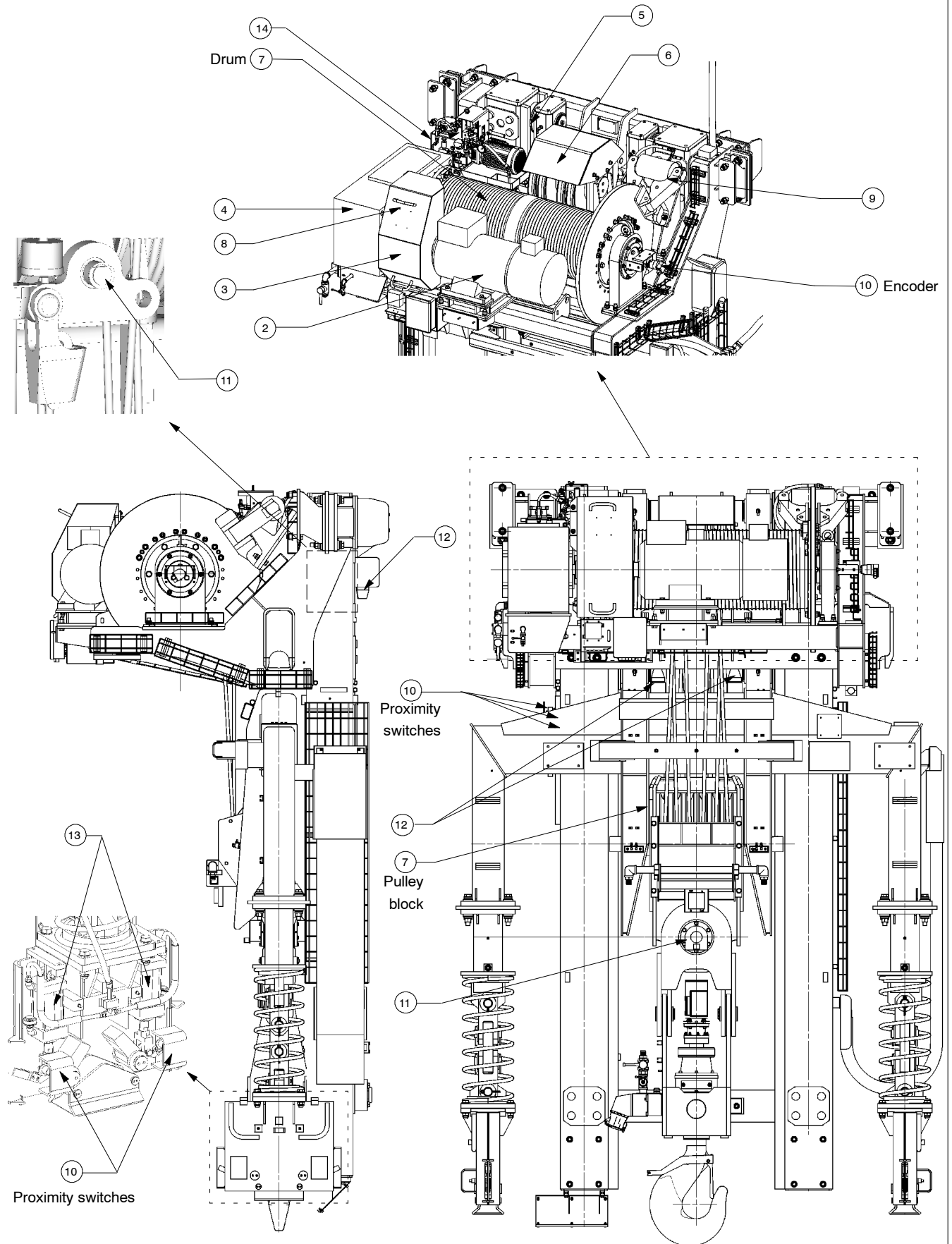


MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

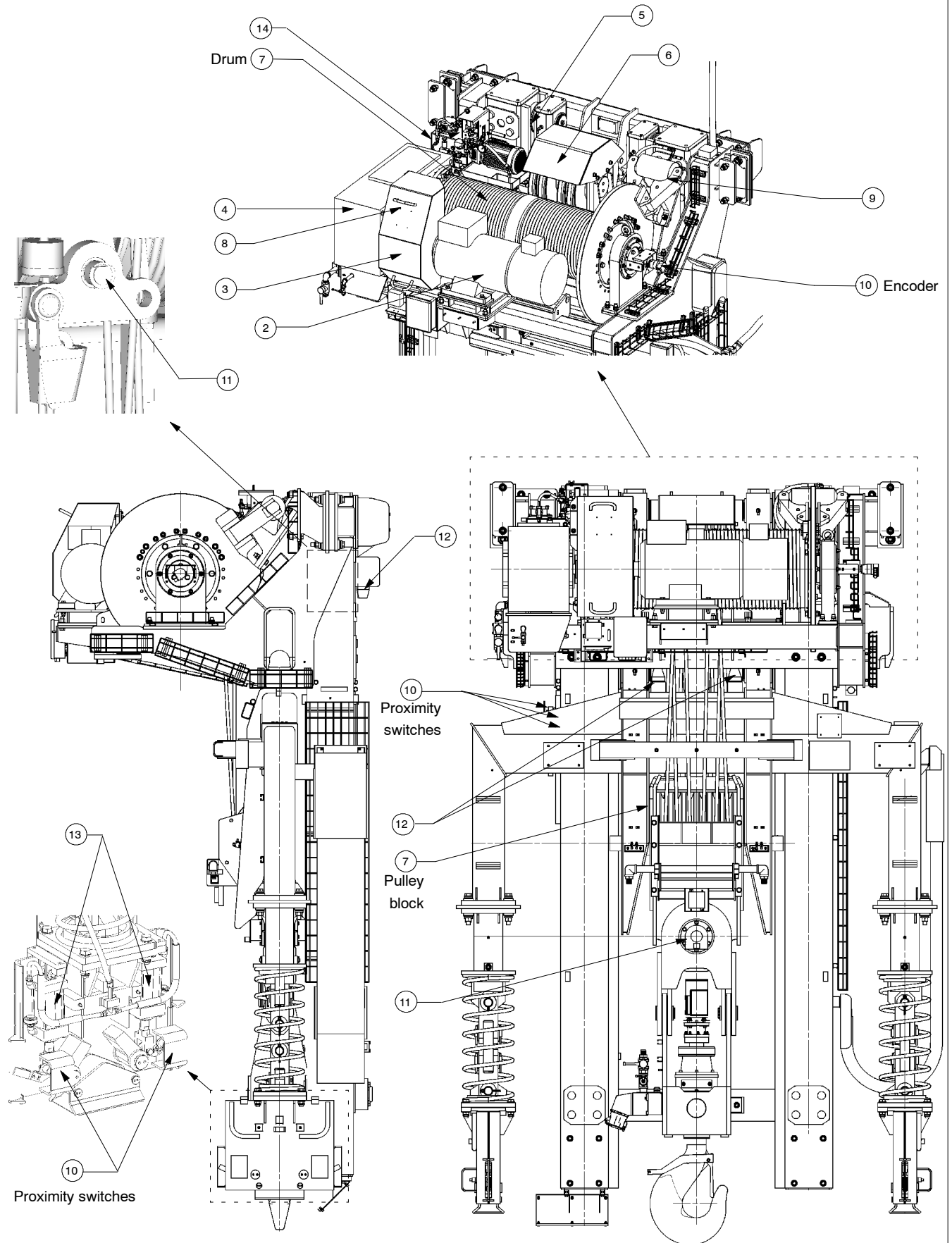
N°	Inspection	See Chap	After starting			Periodic maintenance				
			100	1000	M	100	1000	M	Y	L
TAPPING TOOL (LIFTING)										
1.	Main assembling - Tightening torque of the fixings - Visual inspection of general condition (cracks, abnormal deformation) - Dry cleaning	4			1 1			3	1 1	
2.	Motor (See supplier manual for more recommendations) - Tightening torque of the fixings - Replaced plugs on condensation drain holes - Check bearings (abnormal noise or vibration, abnormal temperature)	7	0.5					6 6 6		
3.	Coupling box - Visual inspection of general condition (cracks, abnormal deformation) - Control at starting and in operating inspection (noise level)							6 6		
4.	Reducer Key recommendations (See supplier manual for more recommendations) - Oil level inspection - Oil changing - Visual inspection and cleaning of the vent plug - Visual inspection of the sealing - Fixings inspection - Inspection at starting and in operation (noise level)	4	2		1			3 3 3 3	2 1	
5.	Guiding wheels of the mobile frame (x4) - Grease make up - Tightening torque of the fixings - Wear and tear inspection : Wear = 1.5 mm maxi on radius	4			1			6	1 1	
6.	Lifting cables • Lubricate rope ----- - Check rope for damage and broken wires - Wedge box inspection : - Check cracks absence by penetrant inspection - Check the length of cable without load = 150 mm mini	4			1			6 3 3 3		
7.	Drum, pulley block • Grease make up of the drum bearing ----- - Inspection of the correct winding - Wedge box inspection : - Check cracks absence by penetrant inspection - Check the length of cable without load = 150 mm mini - Visual inspection of general condition (cracks, abnormal deformation) - Check rope securing devices and play of rope guide on drum	4						3 3 3 3 6	1	

Figure 15 - Tapping tool



N°	Inspection	See Chap	After starting			Periodic maintenance				
			100	1000	M	100	1000	M	Y	L
8.	Compensated brake 52 (See supplier manual for more recommendations) <ul style="list-style-type: none"> - Fixings inspection - Visually check the thickness of the linings - Check the disc surface - Coat with grease the brass sliding rings of the fixed body - Rebuilding the caliper 	4						3 3 3 3	5	
9.	Safety brake TH9 Key recommendations (See supplier manual for more recommendations) <ul style="list-style-type: none"> - Check lining wear and set after 1 mm of wear on each lining - Monitor the state of the disc surface - Monitor the state of the pads - Proceed with reconditioning - Replace oil 	4						6 6 6	5 5	
10.	Proximity switches & encoder <ul style="list-style-type: none"> - Cleanliness and operating inspection (Dry cleaning and gap adjustment) - Fixings inspection : check sensors can't move 							3 6		
11.	Balance cross bar <ul style="list-style-type: none"> - Check the horizontal position of the balance cross bar . If it's too tilted, re-adjust (risk of slack in a line) <u>Dynamometric axle</u> <ul style="list-style-type: none"> - Fixings inspection - Electrical connections inspection 				1			3 3 3		
12.	Progressive thrust of the mobile frame (x6) <ul style="list-style-type: none"> - Wear and tear inspection (maximum length stressed = 45 mm) 								1	
13.	Pneumatic cylinder <ul style="list-style-type: none"> - Tightness of cylinder, pipe and hoses - Operating inspection (speed, stroke, ...) - Visually check the seals for leakage - Grease make up - Breather replacement : 0-01-327-09 	6						3 3 3 3	1	
14.	Hydraulic unit <ul style="list-style-type: none"> - Oil level alarm in control cab inspection (every day) - Oil level filling - Oil level inspection (every week) 							Day 3 Week		

Figure 15 - Tapping tool



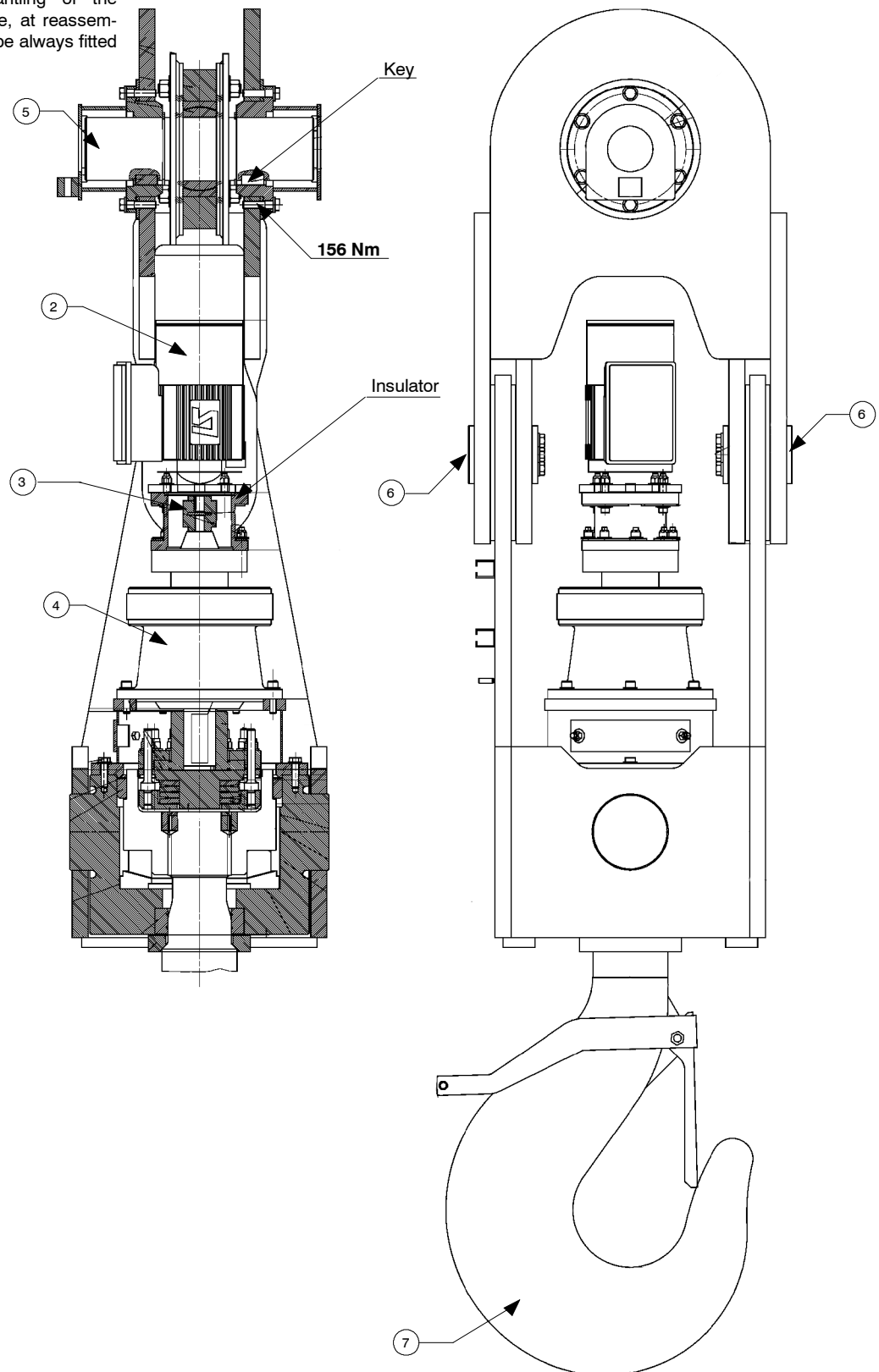
MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

N°	Inspection	See Chap	After starting			Periodic maintenance				
			100	1000	M	100	1000	M	Y	L
TAPPING TOOL (HOOK ROTATION)										
1.	Main assembling - Tightening torque of the fixings - Visual inspection of genral condition (cracks, abnormal deformation)				1 1				1 1	
2.	Motor (See supplier manual for more recommendations) - Tightening torque of the fixings - Replaced plugs on condensation drain holes - Check bearings (abnormal noise or vibration, abnormal temperature)	7	0.5					6 6 6		
3.	Coupling box - Visual inspection of general condition (cracks, abnormal deformation) - Control at starting and in operating inspection (noise level)							6 6		
4.	Reducer - Oil level inspection - Oil changing - Visual inspection of the sealing - Fixings inspection - Inspection at starting and in operation (noise level) - Grease lubricated gears	4	2		1			3 3 3 6	2 1	
5.	Dynamometric axle - Fixings inspection - Electrical connections inspection							3 3		
6.	Shouldered axles - Grease make up							3		
7.	Hook with safety catch - Visual inspection of genral condition (cracks, abnormal deformation) - Operating inspection							3 3		

Figure 16 : Hook rotation

In case of dismantling of the dynamometrical axle, at reassembling, the key must be always fitted on the top



MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

N°	Inspection	See Chap	After starting			Periodic maintenance				
			100	1000	M	100	1000	M	Y	L
CABIN ASSEMBLY										
1.	Main assembling - Tightening torque of the fixings - Visual inspection of genral condition (cracks, abnormal deformation) - Dry cleaning	4			1 1			 3	1 1	
2.	Thrust - Visual inspection of genral condition (cracks, abnormal deformation)							3		
3.	Floodlights, flashing light, klaxon, mirror - Cleanness, operating inspection							Day		
4.	Telescopic ladder - Fixings inspection - Visual inspection of genral condition of cable and pulley (cracks, abnormal deformation) - Inspection of the ladder locking - Test				1			3 3 3 3		
5.	Safety strap - Visual inspection							3		
6.	Proximity switches - Cleanness and operating inspection (Dry cleaning and gap adjustment) - Fixings inspection : check sensors can't move							3 6		

Figure 17 : Cab assembly

MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

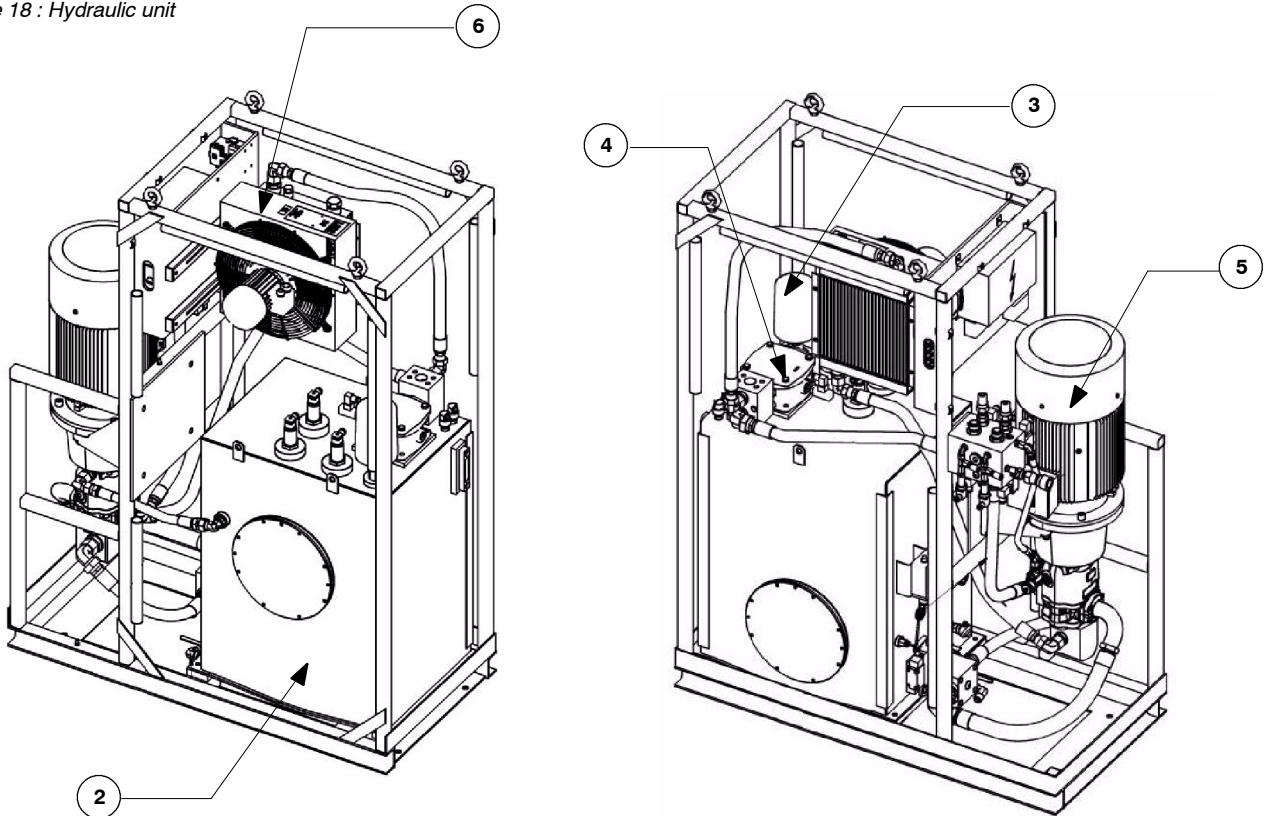
N°	Inspection	See Chap	After starting			Periodic maintenance				
			100	1000	M	100	1000	M	Y	L
HYDRAULIC UNIT										
1.	Main assembling - Tightening torque of the fixings - Visual inspection of genral condition (cracks, abnormal deformation) - Dry cleaning	4			1 1				1 1	
2.	Oil tank (A0)	5							1	
3.	Ventilation filter / Breather (A4)	5							1	
4.	Oil return filter (A5)	5		4					1	
5.	Electric motor (B1) - See Chapter “Electrical maintenance”	7								
6.	Air / oil cooler (D0) - See Chapter “Hydraulic maintenance”	5								
FOR MORE DETAILS SEE CHAPTER HYDRAULIC MAINTENANCE										

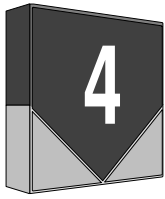


WARNING

When oil changing, adhere to the instructions and recommendations concerning the tank pressure equalizing.

Figure 18 : Hydraulic unit





MECHANICAL MAINTENANCE

CONTENTS OF THE CHAPTER

GENERAL INSTRUCTIONS FOR MECHANICAL MAINTENANCE	4.1-1
ASSEMBLING WITH INSULATING BLOCKS	4.2-1
MAINTENANCE INSPECTION OF A BOLTED ASSEMBLY	4.3-1
EXECUTION TOLERANCES AND PERMISSIBLE DEFLECTION OF THE RUNWAY GIRDERS	4.4-1
COMPENSATED BRAKE TYPE 52 / 52F	4.5-1
SAFETY BRAKE TYPE SH5	4.6-1
STANDARD LIFTING CABLES INSTALLATION	4.7-1
TAPPING TOOL LIFTING CABLES INSTALLATION	4.8-1
SAFETY LINE SECURIFIL OPTIMA	4.9-1
DRIVING WHEEL	4.10-1
IDLE WHEEL	4.11-1
GUIDING WHEEL	4.12-1
REDUCERS K..7	4.13-1
REDUCER 305L3	4.14-1
REDUCER CVVJS 6145	4.15-1
REDUCER MC..	4.16-1
SLEWING GEARS	4.17-1
BARREL COUPLING	4.18-1
ALUMINE MEASURE DRA O	4.19-1

4.1 GENERAL INSTRUCTIONS FOR MECHANICAL MAINTENANCE

(revision of 18/06/2008) / ECL Document reference 0-04-982-79 rev.06 / 1-10-367-13 rev.01 / 1-10-362-49 rev.00

1. PRELIMINARY



For all maintenance operations, the operator must have a thorough knowledge of these general instructions. For dismantling, it is better to operate on a complete assembly and to perform the maintenance operations in a maintenance workshop. If this is not possible and if this maintenance is performed on site, the operator must :

- 1 Before all dismantling operation, ensure the safety conditions (machine switched off, access conditions, lifting means...) and adhere to the safety rules in effect on plant.
- 2 Use the assembly drawings (included in the spare parts manual) and, in some cases, the dismantling and assembling procedures (included in the "Mechanical Maintenance" chapter).
- 3 When refitting, the parts have to be completely cleaned (degrease if necessary).
- 4 Check that no alumina dust or any other foreign body get into the mechanisms. It would lead to a very fast wear of the mechanisms.

2. PRECAUTIONS FOR ASSEMBLING AND DISMANTLING A MECHANISM

2.1. INSPECTION

Before fitting a replacement part, it is necessary to check that the part corresponds to its description and to inspect its surface condition (surface free from dust, rust, oil, paint....).

2.2. PART LOCATION

Before dismantling a mechanism, first identify the different parts in the assembling order to avoid reversal when refitting.

3. BEARING

When assembling, refer to the instructions specified in assembling and dismantling procedures (hot assembling, press fitting and assembling process).

For taper roller bearings, do not separate the external and internal cages (they are paired).

Respect the greasing instructions specified in the "Preventive Maintenance" chapter and / or the information included on the assembly drawings.

4. KEYING

For keyed shaft assembling, check the correct key adjustment on hub and shaft to avoid shear risks.

5. SPRINGS

After every action on systems with spring, check, when refitting, that the prestressed dimension is correct. This dimension is indicated in dismantling and assembling procedures or in the "Preventive Maintenance" chapter or on the assembly drawing.

6. GASKET

Before to assemble lipped gaskets, their springs have to be greased. For assembling, use calibrated rings according to the diameter and consult the corresponding drawing for the way they have to be mounted (**See Figure 1**).

For all bearing assembling with "NILOS" type seal, the bearing stamped side has to be opposite mounted to the seal side (**See Figure 2**).

If the seal is a "SIMRIT" type lipped gasket, this precaution is not necessary.

Figure 1 – Lipped gasket

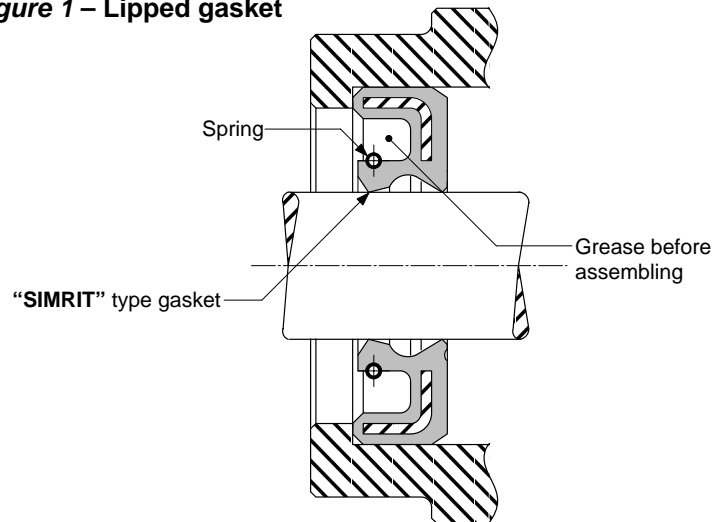
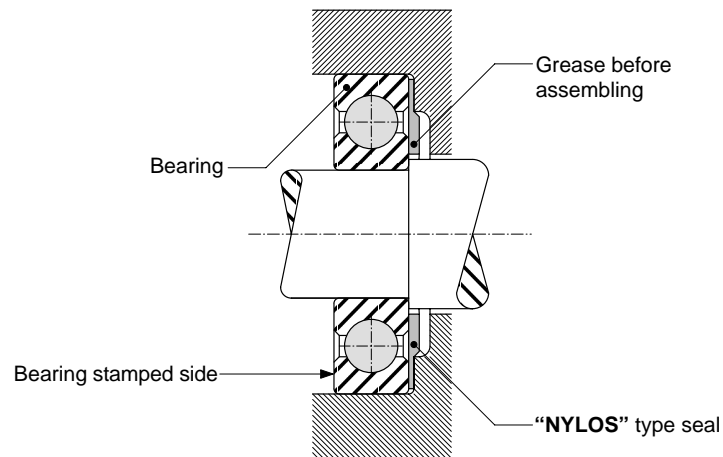


Figure 2 – "NYLOS" type seal



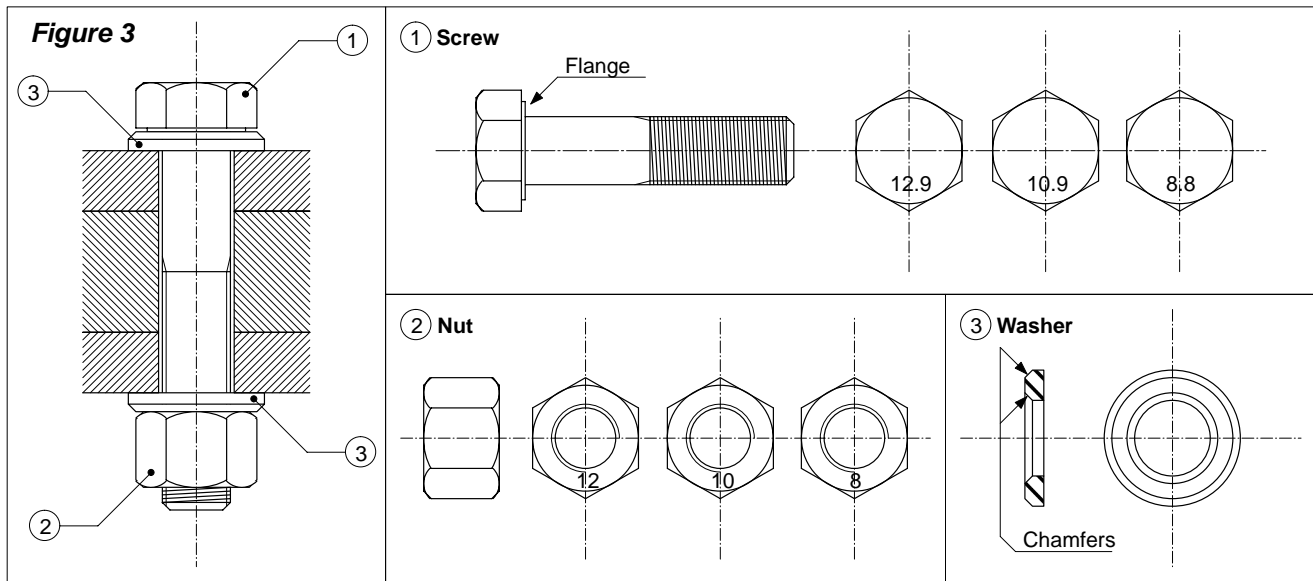
7. PRESTRESSED ASSEMBLING WITH BOLTS

7.1. DESCRIPTION

The bolts used in prestressed assembling consist of : **(See Figure 3)**

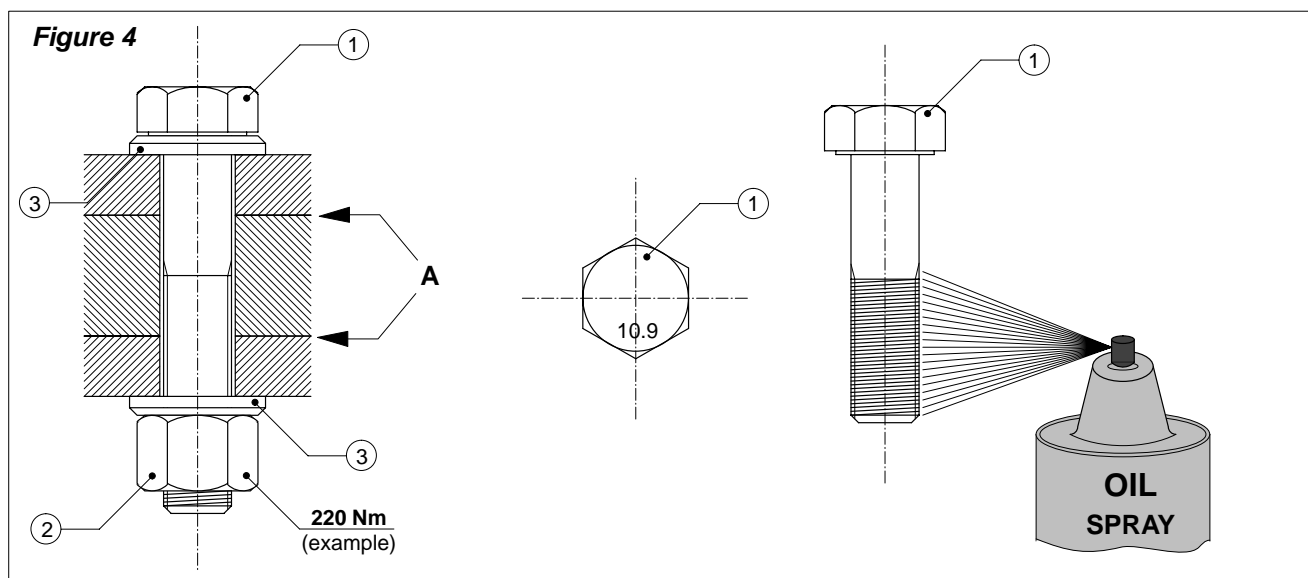
- An hexagonal head screw **(1)** with flange, the steel quality is stamped on the screw head (8.8, 10.9 or 12.9).
- An hexagonal nut **(2)**, high resistance, with the same steel quality as the screw (8, 10 or 12).
- Two plain washers **(3)**, high resistance, these washers include two chamfers (internal and external chamfers).
- The prestressing is applied with the tightening torque specified on the assembly drawing and by adhering to the assembling instructions specified in the following section.

Note : The bolts, screws, nuts and washers are oiled delivered (antirust protection).



7.2. ASSEMBLING INSTRUCTIONS (See figure 4)

- Clean assembly surfaces **A** (surfaces free from dust, oil, rust, paint.....).
- Ensure that the steel quality of the screw and the nut is according to the quality specified in the spare parts the list of assembly drawing (steel quality stamped on the screw head and on the nut).
- For a new bolt, use it as supplied by the manufacturer. (i.e. pre-lubricated with oil)
- For a used bolt, clean it and oil it with a spray.
- Respect the assembling order shown on the assembly drawing.
- When inserting the washers **(3)**, ensure that the chamfer is located on the screw head side and on the nut side.
- When tightening the nut **(2)**, ensure that the steel quality stamped on the nut is not on the washer side.
- Using a torque wrench, apply the tightening torque specified on the assembly drawing, never exceed the tightening torque values specified in following section.
- It is recommended to apply the torque by tightening the nut.
- The tightening of assemblies including several bolts will be carried out from the center to the outer of the assembly, by progressively applying the tightening torque to obtain a regular tightening of the assembly.



- Assemblies with nuts braking :
 - In case of non metallic nut braking, the nut must be changed after each dismantling.
 - In case of metallic nut braking, the nut must be changed after each 3 dismantling.

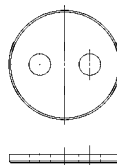
7.3. TIGHTENING TORQUE

- The tightening torque will be applied by means of a calibrated torque wrench.
- Respect the tightening torque values specified on the assembly drawings or the following table when there is no torque specification on the drawing.
- Never exceed the tightening torque values specified in the following table (**MAXIMUM TORQUE VALUES**).

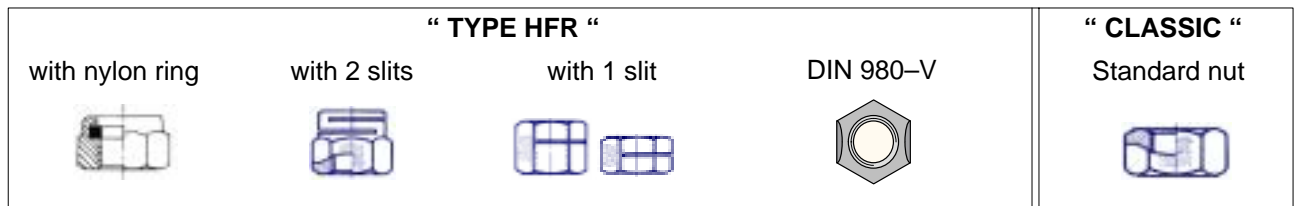
BOLTS FOR ASSEMBLY OF STEEL PARTS				
DIAM.	SCREW 8.8 / NUT 8		SCREW 10.9 / NUT 10	
	"CLASSIC" NUTS WITHOUT ISOLATOR	"CLASSIC" NUTS WITH ISOLATOR	"CLASSIC" & "TYPE HFR(1)" NUT WITHOUT ISOLATOR	"CLASSIC" NUTS WITH ISOLATOR
	N.m	N.m	N.m	N.m
M6	8		12	
M8	20		29	
M10	40		59	
M12	69		102	
M14	111		163	
M16	173	173	255	173
M18	239		352	
M20	339	339	499	339
M22	466		685	
M24	584	584	858	584
M27	865		1271	
M30	1173		1723	
M33	1594		2342	
M39	2600		3905	

(1) see Figure 3

SCREW H OR CHC IN THE TAPPED HOLES MATERIAL							
DIAM.	GRADE 8.8			GRADE 10.9			GRADE 8.8 & 10.9
	STEEL S235	STEEL S355	CAST IRON GJs 400-15	STEEL S355	STEEL 42CrMo4	CAST IRON GJs 400-15	ALUMINIUM (*) Alloy 2017 A
	N.m	N.m	N.m	N.m	N.m	N.m	N.m
M6	8	8	8	11	11	11	8
M8	19	19	19	28	28	28	19
M10	38	38	38	56	56	56	37
M12	66	66	66	98	98	97	64
M14	105	105	105	154	154	154	102
M16	162	162	162	237	237	218	157
M18	230	230	230	328	328	310	225
M20	327	327	327	460	460	410	315
M22	440	440	440	630	630	470	430
M24	560	560	560	800	800	705	545
M27	815	815	815	1100	1100	1100	790
M30	1120	1120	1120	1580	1580	1470	1090

SCREW H WITH 'THRUST WASHER 2 HOLES'	
DIAM.	GRADE 10.9
	ALL MATTER
	N.m
M6	4.5
M8	10
M10	22
M12	30
M16	78
M20	155
M27	385
Example :	
	

(*) Nota : "ALUMINIUM" mean: Assembly of aluminium parts

Figure 3 : Example of hexagon nut self-locking “ TYPE HFR ” & standard nut “ CLASSIC ” used by ECL**IMPORTANT NOTE :**

In case of nut replacement, it should be at the identical

7.4. CHECKING OF THE TIGHTENING TORQUE

The tightening torque of all prestressed assemblies with bolts has to be checked with a calibrated torque wrench :

- After a starting period of 1 to 3 months.
- Thereafter once a year.

7.5. TOOLS

- The tightening torque of all prestressed assemblies with bolts shall be done with a calibrated torque wrench.
- The torque wrenches will be periodically checked and calibrated (checking/quality).

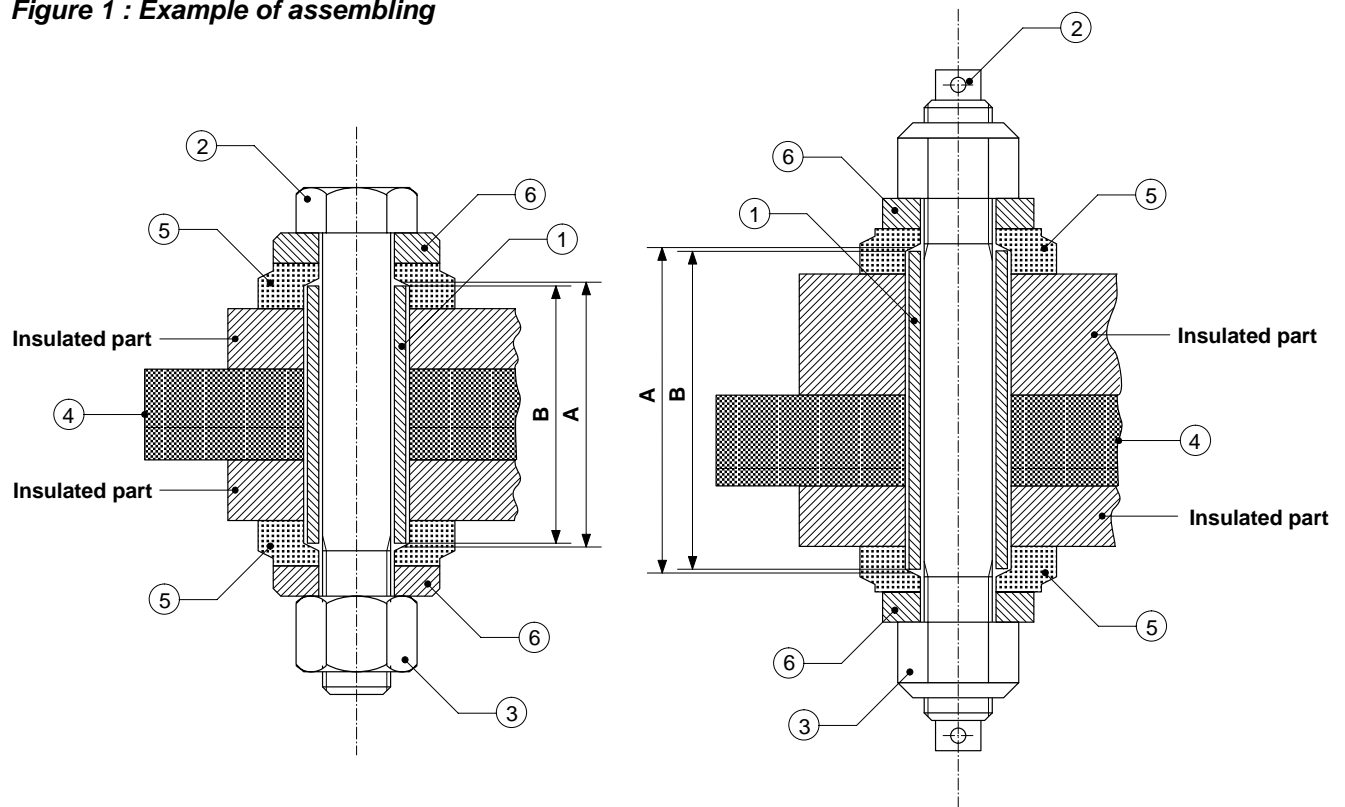
USE OF PNEUMATIC WRENCH (BY SHOCK) IS FORBIDDEN.

4.2 ASSEMBLING WITH INSULATING BLOCKS

1. DESCRIPTION (See Figure 1)

- (1) – Insulating pipe
- (2) – Screw or tie-rod
- (3) – Nut
- (4) – Insulating plates
- (5) – Insulating washer
- (6) – Special metallic washer

Figure 1 : Example of assembling



2. INSTALLATION PROCEDURE

When installation or in case of replacement, proceed the following operations :

- Clean, degrease and dry the assembling surfaces of the metallic and insulating parts to be assembled.
- Respect the assembling order (see assembly drawing).
- Before assembling, check that the dimension **(B)** of the insulating pipe **(1)** is shorter (1 to 2 mm) than the dimension **(A)**.
- Tight the bolt **(2)** with a torque wrench respecting the tightening torque value specified on assembly drawing.

2.1. TIGHTENING TORQUE

- The tightening torque will be applied by means of a torque wrench.
- Respect the tightening torque values specified on assembly drawings.
- Do not exceed the tightening torque values specified in the following table (**MAXIMUM TORQUE VALUES**).

	Assembly M16	Assembly M20	Assembly M24
Torque MAXI	173 Nm	339 Nm	584 Nm
Insulator	0-05-133-00	0-05-133-01	0-05-133-02
Washer	1-10-110-37	1-10-110-38	1-10-110-39

3. MAINTENANCE

The assembling with insulating blocks must be periodically checked, preventive maintenance operations, as follows :

- Visual inspection of the assembling : no metallic or conductive part between the parts to be insulated.
- Dry cleaning of the insulating plates **(4)** and insulating washers **(5)**.
- Tightening torque inspection with a torque wrench :
 - 1 month after starting of the equipment.
 - Thereafter once a year.
- Inspect the electrical insulation of the assembling by measuring the resistance between the insulated parts.

The assembling is correct if the resistance : $R \text{ (measured)} > 5 \text{ M}\Omega$

Note 1 : This operation must be carried out once a year by referring to the information included in electrical diagram.

Note 2 : In case of fault ($R < 5 \text{ M}\Omega$) clean and check the hydraulic or pneumatic pipings, the electric cables located between the two insulated parts, if necessary replace the insulating blocks.

4.3 MAINTENANCE INSPECTION OF A BOLTED ASSEMBLY

ECL Document reference code : 1-10-472-41 rev 00

1. MAINTENANCE INSPECTION OF A BOLTED ASSEMBLY

- 1 – Check that the bolts are present, in good condition and complete (screw, nut and washers).
- 2 – Check that the class of all the screws and nuts in the assembly corresponds to that required in the drawing.
- 3 – Check that the bolts are not loose or broken by applying a torque of 30% of the nominal torque indicated in the drawing or, in the absence thereof, of the torque indicated in the table for this class of bolt. This check will be carried out only in the sense of tightening, without any loosening.

Note : This check at 30% of the torque allows the integrity of the bolts to be checked without the risk of applying a stress to them that they could not withstand.

4 – If one of the bolts of an assembly is found to be loose during this check at 30%, it will be immediately replaced by a new bolt (screw, nut, washers) and all the bolts of this assembly will be replaced. The new bolts will be tightened to the nominal torque indicated in the drawing or, in the absence thereof, to the torque indicated in the table for this class of bolt.

Note : Any bolt accidentally loosened by the operator during inspection will be considered to be found loose, and all the bolts of the assembly will be replaced.

Note : Likewise, any dismantled assembly will be reassembled with new bolts; no bolt already used will be re-used.

5 – Approximately three months after new bolts are mounted on an assembly, the tightening of all the bolts in this assembly will be checked with the nominal torque indicated in the drawing or, in the absence thereof, with the torque indicated in the table for this class of bolt.

Note : the table of the torques can be found in the maintenance manual in the "**mechanical maintenance**" chapter.

2. SPECIAL CASE OF ASSEMBLIES WITH TIE RODS

There are two cases :

- The tie rod has a specific machined end: flat, square, hole, etc.
- The tie rod does not have a specific machining.

Tightening a tie rod with a specific machined end to torque will always be done by tightening the nut located near this machined end while holding the tie rod by this machining with a second wrench (or a rod through the hole, in the case of a hole). This method avoids twisting the tie rod during tightening, and the torque applied is in fact used to put the tie rod under stress as one would do with a bolt. The torque to be applied is that indicated in the assembly drawing; the inspection rules are the same as those for bolts.

For a tie rod with no specific machining, tightening will be carried out as for a bolt. The torque to be applied is that indicated in the assembly drawing; the inspection rules are the same as those for bolts.

4.4 EXECUTION TOLERANCES AND PERMISSIBLE DEFLECTION OF THE RUNWAY GIRDERS

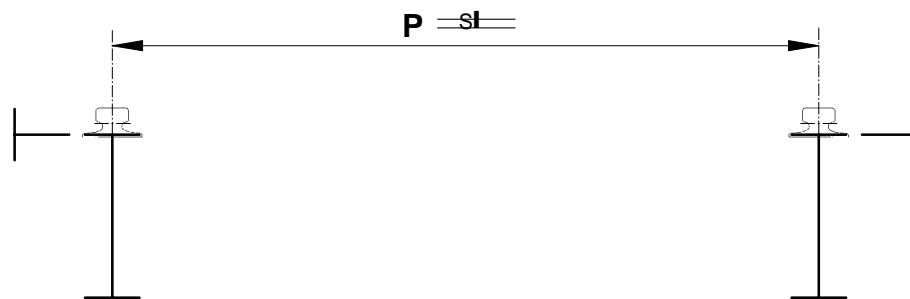
ECL Document reference code : 0-03-982-65 rev 01 (except §3)

1. TOLERANCES

1.1. SPAN TOLERANCE

Execution tolerances of the runway rails

– Span (P)



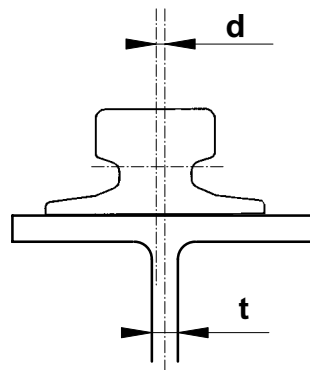
$$\text{Tolerance : } S \leq \pm \left(\frac{P}{10} + 6 \right)$$

S in mm

P in m

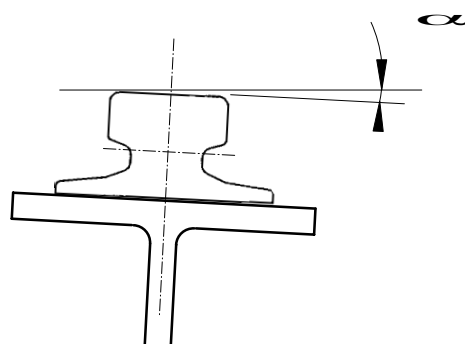
1.2. RAIL AXIS TOLERANCE

– Offset of the rail center line in relation with the girder center line



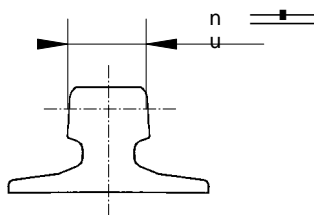
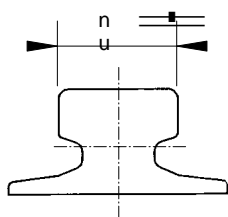
$$d = \pm \frac{t}{2}$$

1.3. RAIL INCLINATION



$$a = \pm 0.3 \%$$

1.3.1. RAIL DIMENSION TOLERANCES (mm)



$n \leq 55 \text{ mm}$	$u = \pm 0.6$
$65 \text{ mm} \leq n \leq 75 \text{ mm}$	$u = \pm 0.8$
$n > 75 \text{ mm}$	$u = \pm 1$

1.3.2. RECOMMENDED STEEL QUALITIES

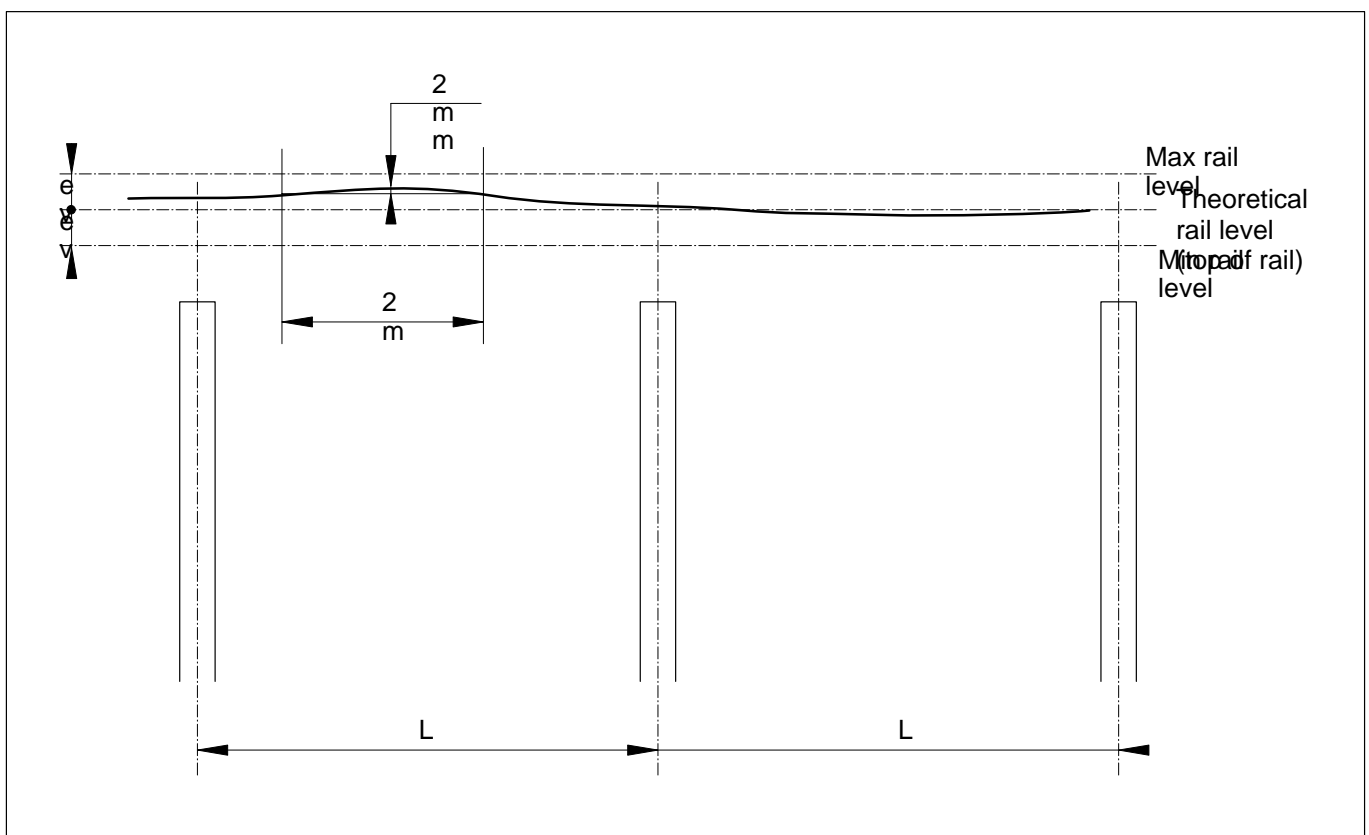
Quality	C	Mn	Si	S	P	V	R (N/mm ²)	Brinell HB	Le (N/mm ²)	A 5d %
90	0.60 – 0.73	0.90 – 1.20	0.20 – 0.40	0.050 max	0.050 max	–	880 – 1030	265 – 310	≥ 440	≥ 8
90-V	0.45 – 0.55	0.90 – 1.20	0.15 – 0.30	0.050 max	0.050 max	0.110 – 0.170	880 – 1030	265 – 310	≥ 550	≥ 10

R = Tensile strength

Le = limit of elasticity

A = Elongation

1.4. RAIL RECTITUDE ON A FILE OF RUNWAY GIRDERS IN VERTICAL PLANE



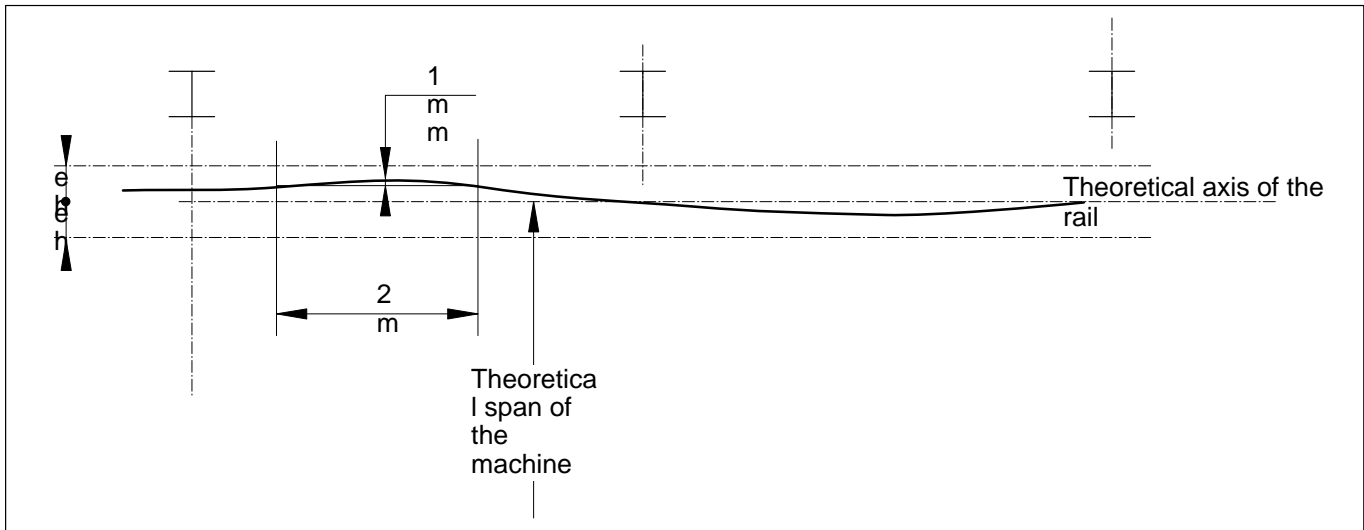
$ev = \pm 10 \text{ mm}$

Maximum offset on 2 m = $\pm 2 \text{ mm}$ in any point of the rail

The theoretical rail level is either the horizontal level or the line corresponding to the camber with a maximum equal to $\frac{L}{2000}$

L = distance between the basis of the girder

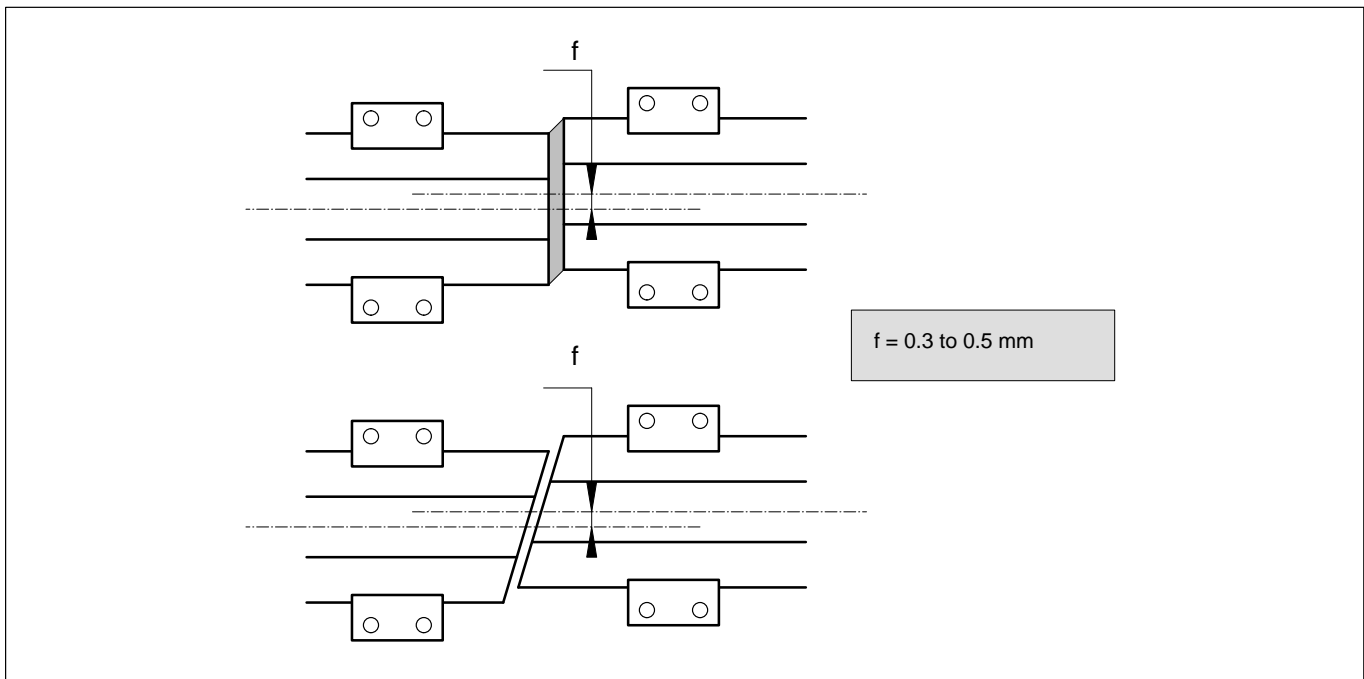
1.5. RAIL RECTITUDE ON A FILE OF RUNWAY GIRDERS IN THE HORIZONTAL PLANE



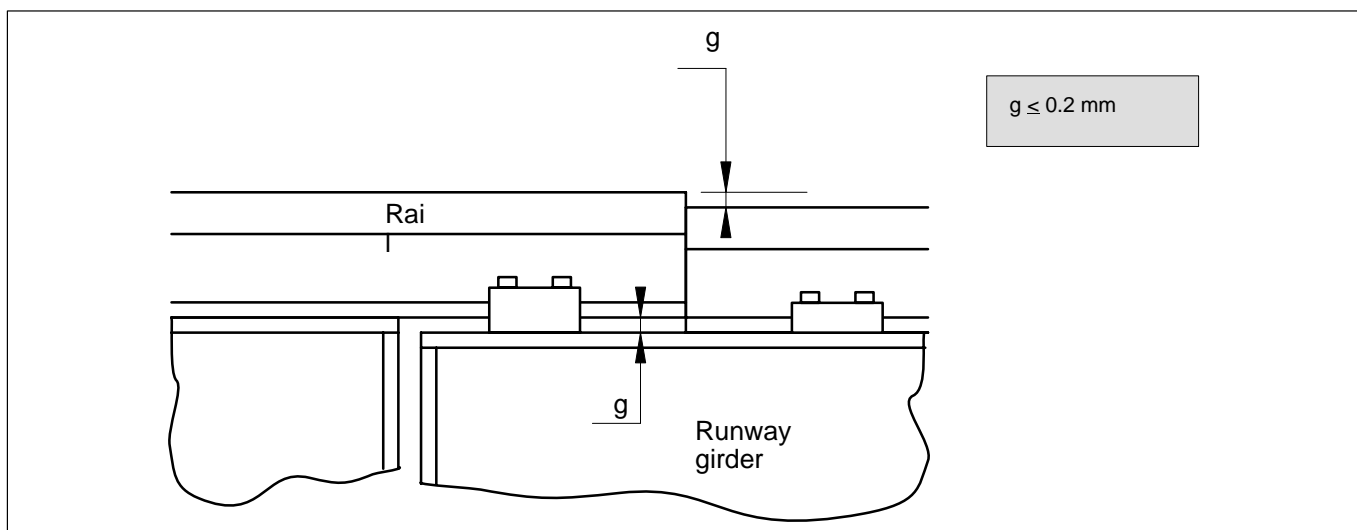
$$eh = -10 \text{ mm}$$

Maximum offset on 2 m = ~~1 mm~~ in any point of the rail

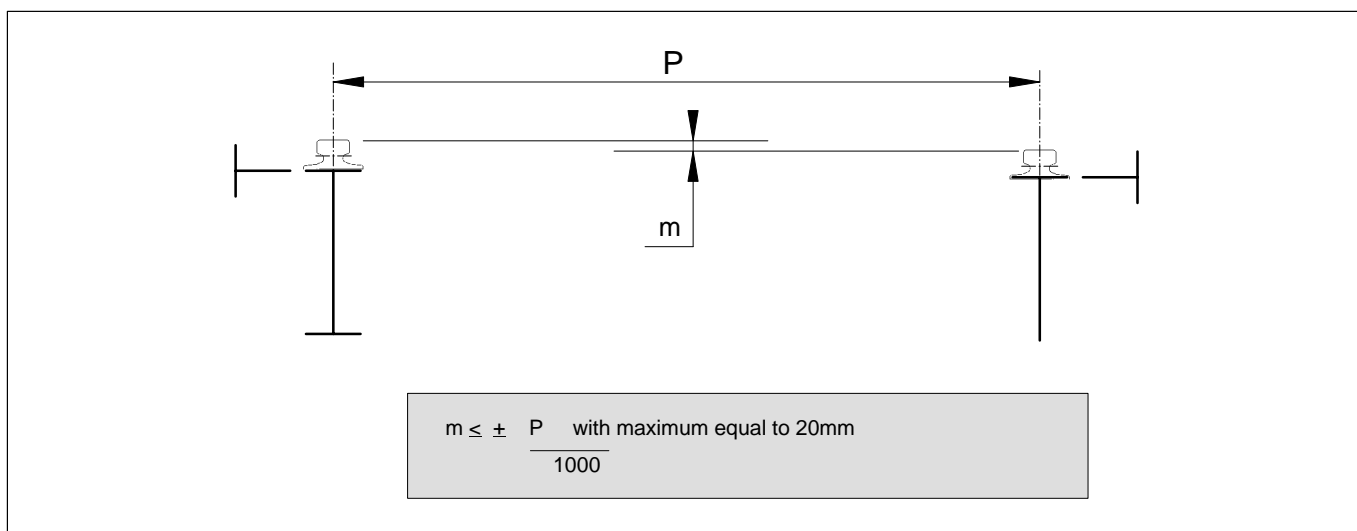
1.6. MAXIMUM OFFSET IN THE HORIZONTAL PLANE, BETWEEN TWO RAILS AT THE JOINT OR THE WELDING



1.7. MAXIMUM OFFSET, IN THE VERTICAL PLANE, BETWEEN TWO RAIL AT THE JOINT OR THE WELDING

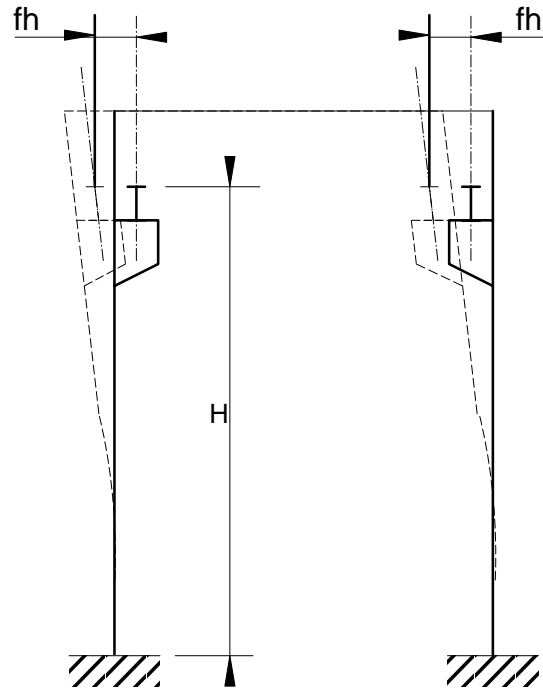


1.8. MAXIMUM DIFFERENCE IN LEVEL BETWEEN BOTH RAILS MEASURED AT ANY TRANSVERSAL SECTION



2. PERMISSIBLE DEFORMATION INTO SERVICE

2.1. PERMISSIBLE HORIZONTAL DEFORMATION IN FRONT OF THE SUPPORTS



$fh =$ without wind — 360	H
$fh =$ with wind — 200	H

with a maximum
equal to 50mm

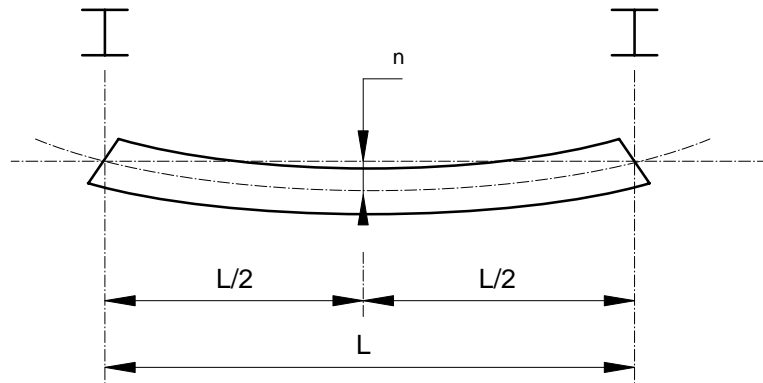
NOTE :

- The deformation calculation must be done without increasing factors

Must take in consideration :

- the dead loads (building and machines)
- the maximum horizontal loads of the machines
- the maximum vertical loads of the machines calculated according the recommendations of the part 3
- the wind loads applied on the vertical faces of the building
- possibility of snow loads

2.2. PERMISSIBLE HORIZONTAL DEFORMATION BETWEEN TWO BASIS

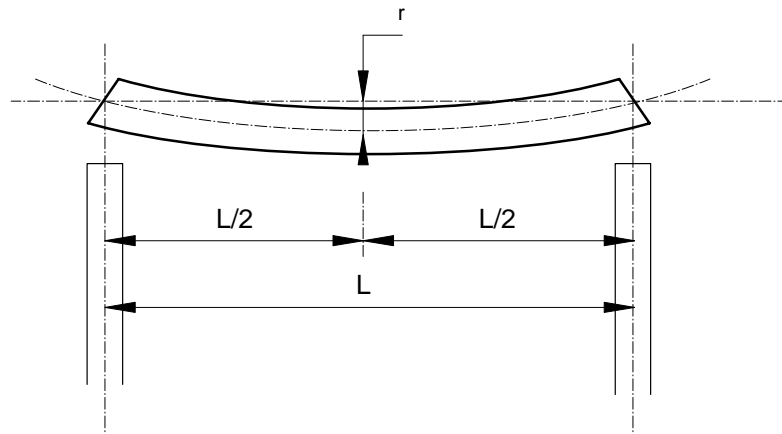


$$n \leq \pm \frac{L}{1000}$$

measured at the center line of the building girder
and at the rail level.

See paragraph 2.1

2.3. PERMISSIBLE VERTICAL DEFORMATION BETWEEN TWO BASIS



$$r \leq \pm \frac{L}{800}$$

measured at the center line of the
building girder.

See paragraph 2.1

4.5 COMPENSATED BRAKE TYPE 52 / 52F

Note : For Electrical supply unit (SIME) see chapter ELECTRICAL INSTRUCTIONS.

1. DESCRIPTION

Location	ECL code	Reference
Tapping tool / Hoist unit	0-02-129-00	52

2. BRAKING TORQUE RECOMMENDED VALUES

ECL document reference : Calculation sheet [1-10-662-94 rev 00](#)

Dia disc	Adjusting dimension (D)	Adjusting range	Recommended torque
445 mm	6.6 mm	Min : 150 Nm / Max : 360 Nm	345 Nm

3. BRAKING TORQUE READJUSTMENT

When starting up or in case of replacement, the brakes will be adjusted to the recommended torque. Respect the adjusting dimension D measured on the brake (see page 4/5 of SIME manual).

After commissioning period, the brakes will be adjusted again if necessary by increasing or decreasing of the adjusting dimension D. When the adjusting dimension D increases, the braking torque increases proportionally (see page 4/5 of SIME manual).

**WARNING**

Never adjust the brake at a value upper than the braking torque value recommended in the following table
In case of lining pads replacement, use only the lining pads reference written in the spare parts manual

4. LINING PADS REPLACEMENT

An instruction tag with replacing procedure is stuck on each brake electromagnet.

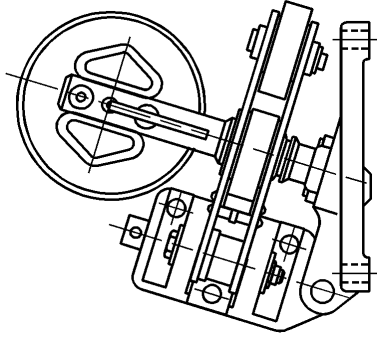
Before releasing the brake, lower or secure the load.

**WARNING**

A lining pads replacement requires a grinding of it. After each replacement of lining pads, make 5 fast rises and 5 fast descents with braking.

1- MAIN CHARACTERISTICS

- Braking by spring force
- Electromagnetic release
- Automatic lining wear compensation
- To be associated with discs 30 mm thick.



2- DISC AND SUPPORTING STRUCTURE

2-1 Disc

After mounting the disc, verify that the run-out does not exceed ± 0.1 mm.
Clean the disc carefully.

2-2 Supporting structure

The caliper must be mounted and secured preferably by bolts on a rigid baseplate which needs not to be machined (must be flat within ± 1 mm).
Check dimensions E and G to ensure a good caliper position relatively to the axis of the disc.

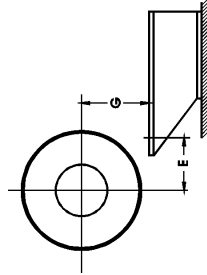


Fig. 1

If the instructions in this manual are not adhered to, the performance, correct operation and the safety of the equipment cannot be guaranteed.

3-3 Mounting (fig. 3 and 4)

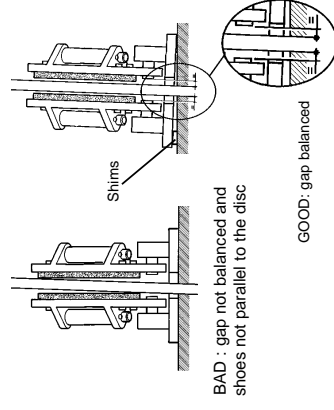
Tools: 2 x 19 mm flat wrench

- Check that the manual release wrench (17) is screwed home so as to bring a zero air gap.
- Remove the stop screw (29) which prevents the fix cam (6) from rotating.
- Rotate the fix cam (6) for 90° backwards while holding the mobile cam (7) in its position.
- Unscrew the screw (28) from free wheel casing
- Move the shoes away from the disc by pressing at the back of the two arms.
- Bring the caliper up to the disc.
- Centre and align the caliper (fig. 4) relatively to the disc by checking:
 - that the shoe faces are parallel to the disc (shim the caliper or the supporting structure as necessary to perform parallelism),
 - that the axis of symmetry of the caliper arms is precisely in the plane of symmetry of the disc the shoe support pins at their bottom (they should be equally spaced on each side of the disc),
- Fit the lining pads,
- Check that the pad surface rest well on the disc (fig. 3),
- Bolt the caliper down on the supporting structure,
- Press the front of the 2 arms together (fig. 8) to bring the pads in contact with the disc, the mobile cam (7) engages itself because of its inner spring,
- Rotate the fix cam (6) for 90° forwards until it is possible to mount its stop screw (29) and tighten it.
- Once in position, remove the mobile cam (7) back by 1 cm,
- Overtighten the screw (28) located on the collar of the free wheel casing.

Fig. 3



Fig. 4



BAD : gap not balanced and shoes not parallel to the disc

GOOD: gap balanced

- **Untighten the manual release wrench (17) by 10 mm (approx. 7 turns)**, the caliper remains closed on the disc.
- Check parallelism again between disc and linings,
- Actuate the caliper a few times to check its good functioning.

The caliper is then ready to operate.

If the instructions in this manual are not adhered to, the performance, correct operation and the safety of the equipment cannot be guaranteed.

Disc brakes - Calipers 52 and 52F

3-4 Electric connections

a) Electromagnet (28) (fig. 5 et 8)

Connect the two-core cable (2 x 2 mm², Ø ext. 8.5 mm and length 2 m) to a direct current mains supply or a suitable power supply. Check the electrical working state by energizing the electromagnet (28), the caliper must open.

Fig. 5

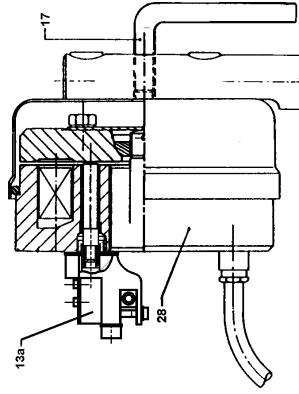


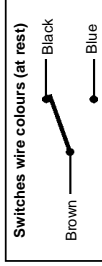
Fig. 7



Tool: 5 and 10 mm Allen wrenches

- Open the caliper manually by screwing home the manual release wrench (17) (fig. 9),
- Release the free wheel (12) by moving the screw (28),
- Remove the stop screw (29) which prevents the fix cam (6) from rotating,
- Rotate the fix cam (6) for 90° backwards while holding the mobile cam (7) in its position,
- Move the shoes away from the disc by pressing at the back of the two arms,
- Replace the pads,
- Press the front of the 2 arms together (fig. 9) to bring the pads in contact with the disc, the mobile cam (7) engages itself because of its inner spring,
- Rotate the fix cam (6) for 90° forwards until it is possible to mount its stop screw (29) and tighten it,
- Once in position, remove the mobile cam (7) back by 1 cm,
- Overtighten the screw (28) located on the collar of the free wheel casing,
- **Untighten the manual release wrench (17) by 10 mm (approx. 7 turns)**, the caliper remains closed on the disc,
- Actuate the caliper a few times to check its good functioning. The caliper is then ready to operate.

Fig. 6



If the instructions in this manual are not adhered to, the performance, correct operation and the safety of the equipment cannot be guaranteed.

Disc brakes - Calipers 52 and 52F

5-2 Adjusting the braking torque (fig. 8 and 9)

This operation is performed with the caliper switched off and closed on the disc or a dummy disc.

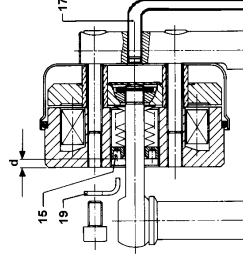
DANGER!

When torque lowers down, the closing response time increases as well as the stopping distance. Check this is compatible with the installation.

Tool: 10mm Allen wrench

- Open the caliper manually by screwing home the manual release wrench (17),
- Release the free wheel (12) by moving the screw (28),
- Remove the stop screw (29) which prevents the fix cam (6) from rotating,
- Rotate the fix cam (6) for 90° backwards while holding the mobile cam (7) in its position,
- Move the shoes away from the disc by pressing at the back of the two arms,
- Remove the pads,
- Untighten the manual release wrench (17) by 10 mm (approx. 7 turns) to get a wide air gap and a complete spring compression release,
- Remove the stop screw and its retaining plate (19) of the torque adjustment nut (15)
- Find, on the diagram (fig. 10), the position (d) of the adjustment nut (15) which depends on the required braking torque,
- To adjust (d), use the 4 holes or notches of the torque adjustment nut (15) (pitch: 1.5 mm) by:
 - SCREWING to increase the braking torque
 - UNSCREWING to decrease the braking torque

Fig. 8



- fit the stop screw and its retaining plate (19), rotate, if necessary, the torque adjustment nut (15) to engage the retaining plate in the nearest hole
- Screw the manual release wrench (17) to get a zero air gap,
- Fit the lining pads,

STOP

Only the use of our original spare parts can guarantee reliability of the calipers.

5-3 In-service preventing control

- Visually check the thickness of the linings if they are not fitted with a wear detector,
- Check the disc surface
- Do not soil the linings or the disc with oil or grease projections
- Coat with grease the brass sliding rings of the fixed body.

5-4 Rebuilding of the caliper

Rebuild the caliper every 5 years or each 4 x 10° actuations to maintain its characteristics.

6- SPARE PARTS

See relevant leaflet.

ATTENTION!

If the instructions in this manual are not adhered to, the performance, correct operation and the safety of the equipment cannot be guaranteed.

4.6 SAFETY BRAKE TYPE SH5

1. DESCRIPTION

Location	ECL code	Reference	Lining pad
35MT Tapping tool ass'y	1-10-176-84	SH5-6	US2-5

2. BRAKING TORQUE RECOMMENDED VALUES

ECL document reference : Calculation sheet [1-10-662-94 rev 00](#)

DIA DISC	STATIC TORQUE VALUE	DYNAMIC TORQUE VALUE
D. 1030 / d. 500 mm – th. 30	24 178 Nm	28 470 Nm



SUMMARY

Chapter	Title	Page
	NOTES AND SYMBOLS	
1	PRESENTATION	1
1-1	Use	2
1-2	Operating conditions	2
2	OPERATION	2
3	CHARACTERISTICS	3
3-1	Electrical characteristics	3
3-2	Hydraulic characteristics	3
3-3	Option	3
4	POSITIONING	3
4-1	Conditions of delivery	3
4-2	Disc, support and supporting structure	3
4-3	Fastening	3
4-4	Protection	3
5	CONNECTIONS	4
5-1	Electrical connections	4
	a) Opening proving switch	4
	b) Optional wear proving switch	4
5-2	Hydraulic connections	5
6	START-UP	6
6-1	Purge	6
6-2	Settings	6
7	MAINTENANCE	7
7-1	Opening of a caliper	7
7-2	Lining wear compensation	7
7-3	Replacing a set of pads	7
7-4	Periodic checking	8
7-5	Optional wear proving switch setting	8
7-6	Brake reconditioning	8
8	SPARE PARTS	8
	DRAWINGS	9

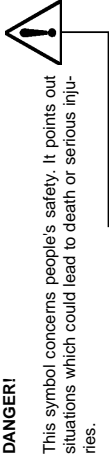
If the instructions in this manual are not adhered to, the performance, correct operation and the safety of the equipment cannot be guaranteed.

Technical data Spare parts	Leaflet No. 3865 No. 9410	Technical data SH5M Installation and maintenance SH5M Spare parts SH5M	11/04	1/10
				8410

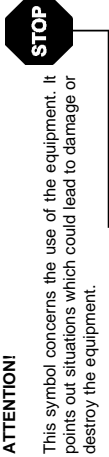
NOTES AND SYMBOLS

According to EEC regulations we use, facing some paragraphs, symbols defining hazards and informing the user about the consequences of not following the instructions of this installation and maintenance leaflet.

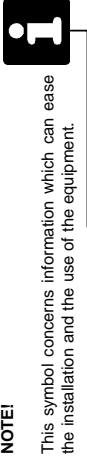
DANGER!



ATTENTION!



NOTE!



If the instructions in this manual are not adhered to, the performance, correct operation and the safety of the equipment cannot be guaranteed.

Technical data Spare parts	Leaflet No. 3865 No. 9410	Technical data SH5M Installation and maintenance SH5M Spare parts SH5M	11/04	2/10
				8410

Disc brake - SH5

1 - PRESENTATION

1-1 Use

The caliper SH5 (fig. 1) is intended to work mainly as an emergency brake.

Fig. 1



When used on hoisting motions, the emergency brake is expected to work in the following cases:

- when an overspeed condition is detected (by means of an overspeed detection device for the load, not provided by SIME INDUSTRIE)
- upon operation on an emergency stop button
- when the electric supply of crane is switched off.

Except the above cases, the brake remains open. However, it is recommended to actuate the brake once per day.

For any other use, consult us.

1-2 Operating conditions

Working conditions:

- Ambient temperature: -10 °C to +60 °C
 - Relative humidity $\leq 70\%$
 - Dust in atmosphere $\geq 65\ \mu$
- Other conditions, consult us.

Installation and maintenance

2-OPERATION

The braking force is performed by a spring.

An hydraulic power unit, connected to the caliper, delivers an hydraulic pressure which makes the caliper to open after switching on an solenoid valve.

Braking occurs by switching off this solenoid valve.

3 - CHARACTERISTICS

3-1 Electrical characteristics

Opening and wear proving switches

250 V, 5A, 50VA AC
220 V, 5A, 50W DC

The wear proving switch is optional.

3-2 Hydraulic characteristics

conform to the standard ISO 6743/4, Grade L-HM or L-HV.
Type HM 32 or HV 32 for ambient temperature from -10 to +50°C.

Avoid to mix oils of type HM with HV.

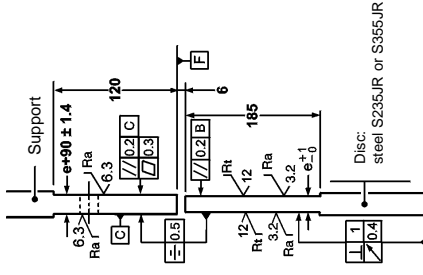
For oils with other characteristics or other temperatures, consult us

Other characteristics of the calipers and the hydraulic power unit are specified in the relevant Technical Data leaflets.

3-3 Option

Option "Mountains": The SH5M caliper is designed for draining possible water condensations, see the relevant leaflets.

Fig. 2



Disc brake - SH5

4-POSITIONING

4-1 Conditions of delivery

Each half caliper is mechanically locked opened by the holding cap and safety washer (9.1). The lining pads and the holding cap (30.3) are not mounted.

Both half calipers of one brake are identified by the same serial number.

One half-caliper is equipped with the opening proving switch, the other one wears only the protection cap.

When supplied, the optional wear proving switch is factory preset to detect a gap of 2mm between each lining and the disc (1mm of nominal gap + 1mm of lining wear per pad).

The wear proving switch is then mounted on a support with the opening proving switch.

4-2 Disc, support and supporting structure (not provided by SIME INDUSTRIE)

Comply with the values specified on fig. 2 and 3 on the technical data leaflet (dimensions, tolerance, surface conditions).

The customer supporting structure and caliper support must be designed to absorb the braking forces without deformation.

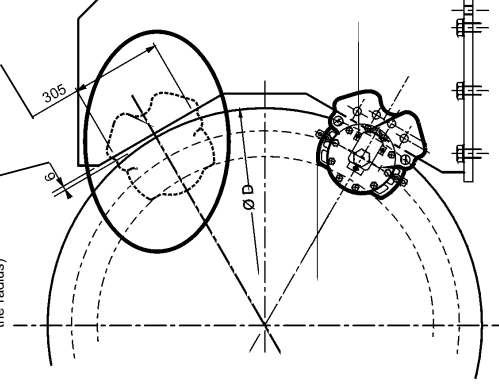
Check:

- Centering, parallelism and the distance of the support relative to the disc,
- Access to the parts of the brake for fixing, settings and maintenance:

- Fixing bolts or tie-rods,
- Opening proving switch,
- Setting screw,
- Pads replacing.

Fig. 3

The support F face must be rectilinear on this length



4-3 Fastening

Fasten the half calipers on their support with 4 x M24 tie-rods (class 10-9) for each caliper (36 mm key).

Tightening torque: 1000 N.m $\pm 10\%$

The tie-rod kit is supplied on option.

DANGER!

Check the tightening torque applied on the tie rods.

4-4 Protection

The brake must be protected against direct harm such as vertical falling waters, sea spray or flames.

If the instructions in this manual are not adhered to, the performance, correct operation and the safety of the equipment cannot be guaranteed.

Technical data	Leaflet No. 3865	Technical data SH5M	Leaflet No. 3865-M	11/04	4/10
Spare parts	No. 9410	Installation and maintenance SH5M	No. 8410-M	No. 9410-M	8410
		Spare parts SH5M			

Installation and maintenance

4-POSITIONING

4-1 Conditions of delivery

Each half caliper is mechanically locked opened by the holding cap and safety washer (9.1). The lining pads and the holding cap (30.3) are not mounted.

Both half calipers of one brake are identified by the same serial number.

One half-caliper is equipped with the opening proving switch, the other one wears only the protection cap.

When supplied, the optional wear proving switch is factory preset to detect a gap of 2mm between each lining and the disc (1mm of nominal gap + 1mm of lining wear per pad).

The wear proving switch is then mounted on a support with the opening proving switch.

4-2 Disc, support and supporting structure (not provided by SIME INDUSTRIE)

Comply with the values specified on fig. 2 and 3 on the technical data leaflet (dimensions, tolerance, surface conditions).

The customer supporting structure and caliper support must be designed to absorb the braking forces without deformation.

Check:

- Centering, parallelism and the distance of the support relative to the disc,
- Access to the parts of the brake for fixing, settings and maintenance:

- Fixing bolts or tie-rods,
- Opening proving switch,
- Setting screw,
- Pads replacing.

4-3 Fastening

Fasten the half calipers on their support with 4 x M24 tie-rods (class 10-9) for each caliper (36 mm key).

Tightening torque: 1000 N.m $\pm 10\%$

The tie-rod kit is supplied on option.

DANGER!

Check the tightening torque applied on the tie rods.

4-4 Protection

The brake must be protected against direct harm such as vertical falling waters, sea spray or flames.

If the instructions in this manual are not adhered to, the performance, correct operation and the safety of the equipment cannot be guaranteed.

Technical data	Leaflet No. 3865	Technical data SH5M	Leaflet No. 3865-M	11/04	4/10
Spare parts	No. 9410	Installation and maintenance SH5M	No. 8410-M	No. 9410-M	8410
		Spare parts SH5M			

Disc brake - SH5

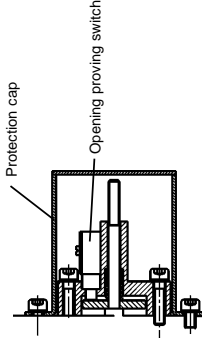
5-CONNECTIONS

5-1 Electrical connections

a) Opening proving switch (fig. 4)

- One half caliper is equipped with the opening proving switch, the other one wears only the protection cap.
- The switch is released when the caliper is closed on the disc, under no voltage (NO: brown and blue wires, NC: brown and black wires) (fig. 6).
- The switch is supplied with a 3 x 0.75 mm² cable of 2m length
 - The opening proving switch is without setting.

Fig. 4

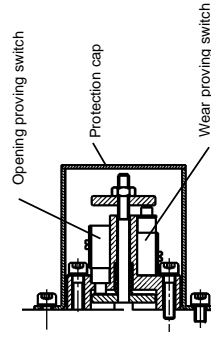


Support + opening switch sub assembly

b) Optional wear proving switch (fig. 5)

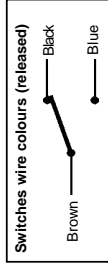
The switch used is the same as the opening one. The support is different from the one with the opening switch alone and bears the 2 switches (opening and wear). The wear proving switch is released as long as the wear limit is not reached.

Fig. 5



Support + opening switch + wear switch sub assembly

Fig. 6



If the instructions in this manual are not adhered to, the performance, correct operation and the safety of the equipment cannot be guaranteed.

Technical data	Leaflet No. 3865	Technical data SH5M	Leaflet No. 3865-M	11/04	5/10
Spare parts	No. 9410	Installation and maintenance SH5M	No. 8410-M	No. 8410	
		Spare parts SH5M	No. 9410-M	No. 9410-M	

Disc brake - SH5

5-2 Hydraulic connections

NOTE!

Also refer to the relevant hydraulic power unit leaflet.



All hydraulic components should preferably be located as close as possible to the calipers. The caliper response time increases with pipe length.

Pipework between power unit and calipers must be the shortest possible so as to avoid unnecessary loss of operating pressure (due to excessively short elbows, narrowings, ...).

If several calipers are being installed (fig. 7), the same kind of pipework (section, length, ...) should be fitted to obtain similar response times.

Nothing should be allowed to obstruct the return flow of oil.

During installation, the greatest care should be kept so as to avoid any introduction of dusts (turnings, fillings, pluses, ...).

Also, it will be necessary to clean pipework before connecting it to caliper jacks with a 5µ filtration unit.

The filling oil will be filtered to 5µ.

NOTE!

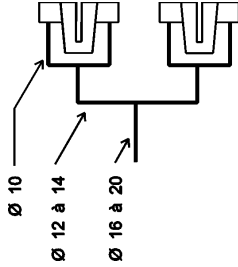
Follow pipework installation rules.

An extra length of flexible piping should be provided at the brake oil intake port.



Fig. 7

External diameters:



If the instructions in this manual are not adhered to, the performance, correct operation and the safety of the equipment cannot be guaranteed.

Technical data	Leaflet No. 3865	Technical data SH5M	Leaflet No. 3865-M	11/04	6/10
Spare parts	No. 9410	Installation and maintenance SH5M	No. 8410-M	No. 8410	
		Spare parts SH5M	No. 9410-M	No. 9410-M	

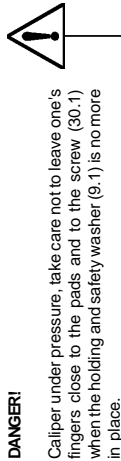
Disc brake - SH5

6- START-UP

- Tools:**
- 5 mm Allen wrench (switches cap (15.5))
 - 24 mm flat spanner (setting screw (30.1))
 - 6 mm Allen wrench (holding cap (30.3) of screw (30.1))
 - 13 mm flat spanner (lining pads)

6-1 Purge

- Fit a see-through pipe onto bleed screw (16.1.1).
- Pressurize the caliper, then unscrew slowly the bleed screw 16.1.1 (11 mm flat spanner) till obtaining an oil stream free of air,
- Complete oil level if necessary.



DANGER!

Caliper under pressure, take care not to leave one's fingers close to the pads and to the screw (30.1) when the holding and safety washer (9.1) is no more in place.

- Fit the lining pads in their recesses, and screw in their 2 secured screws (1.4) holding them
- Pressurize the caliper to open it

On each half caliper:

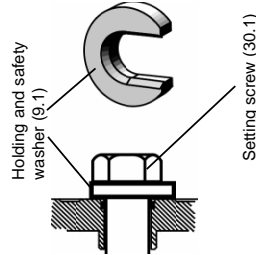
- Remove the holding and safety washer (9.1)
- Screw in (30.1) so as to bring the linings into contact with the disc, without tightening, and screw back to the nominal gap value of 1 mm per side, it means 1/2 of turn
- Turn slightly the screw (30.1) to make it coincide with a groove of the holding cap (30.3) and fix the latter to prevent (30.1) from rotating
- Check that the hydraulic and electrical systems are functioning correctly.

The brake is, then, ready to operate.

ATTENTION!

The disc must be degreased and free of any possible deposit which could decrease the friction coefficient. It will also be necessary to bed-in the lining pads in order to obtain the best performances.

Fig. 8



Installation and maintenance

6-2 Settings

DANGER!

Caliper under pressure, take care not to leave one's fingers close to the pads and to the screw (30.1) when the holding and safety washer (9.1) is no more in place.

- Fit the lining pads in their recesses, and screw in their 2 secured screws (1.4) holding them
- Pressurize the caliper to open it

On each half caliper:

- Remove the holding and safety washer (9.1)
- Screw in (30.1) so as to bring the linings into contact with the disc, without tightening, and screw back to the nominal gap value of 1 mm per side, it means 1/2 of turn
- Turn slightly the screw (30.1) to make it coincide with a groove of the holding cap (30.3) and fix the latter to prevent (30.1) from rotating
- Check that the hydraulic and electrical systems are functioning correctly.

The brake is, then, ready to operate.

ATTENTION!

The disc must be degreased and free of any possible deposit which could decrease the friction coefficient. It will also be necessary to bed-in the lining pads in order to obtain the best performances.

Disc brake - SH5

7- MAINTENANCE

- Tools:**
- 5 mm Allen wrench (switches cap (15.5))
 - 24 mm flat spanner (setting screw (30.1))
 - 6 mm Allen wrench (holding cap (30.3) of screw (30.1))
 - 13 mm flat spanner (lining pads)

DANGER!

Before any maintenance on the caliper, be sure that the caliper can be released at no risk. Caliper under pressure, take care not to leave one's fingers close to the pads and to the screw (30.1) when the holding and safety washer (9.1) is no more in place.

7-1 Opening of a caliper

The caliper is opened by the oil pressure supplied by the hydraulic power unit or the hand pump. Pressure value must be equal to the maximum opening pressure [+0, +20 bars] (see Technical Data leaflet).

7-2 Lining wear compensation

Lining wear must be periodically checked and set again after 1 mm of wear on each lining, it means when the gap reaches 2mm between each lining and the disc.

- Pressurize the caliper

On each half caliper:

- Remove the holding cap (30.3)
- Screw in (30.1) so as to bring the linings into contact with the disc, without tightening, and screw back to the nominal gap value of 1 mm per side, it means 1/2 of turn
- Mount back the holding cap (30.3)
- Depressurize the caliper.

ATTENTION!

A larger gap value than the one specified would reduce the braking force and the spring washer stack life. For any other setting, consult us.

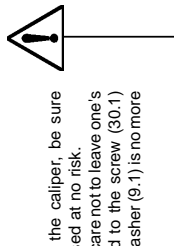


Fig. 9

Holding and safety washer (9.1)

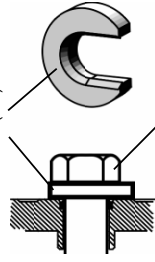
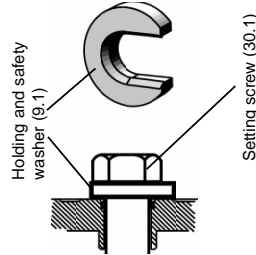


Fig. 8



- It is then possible to switch off the power unit without the caliper closes
- Unscrew the 2 secured screws (1.4) which hold the pad flanges on the shoe
- Fit the new lining pads (1)
- Screw in the 2 secured screws (1.4) holding the pad flange
- Pressurize the caliper

On each half caliper:

- Remove holding and safety washer (9.1)
- Screw in (30.1) so as to bring the linings into contact with the disc, without tightening, and screw back to the nominal gap value of 1 mm per side, it means 1/2 of turn
- Turn slightly the screw (30.1) to make it coincide with a groove of the holding cap (30.3) and fix the latter to prevent (30.1) from rotating
- Check if closing and opening of caliper are correct and if the opening proving switch is working correctly.



If the instructions in this manual are not adhered to, the performance, correct operation and the safety of the equipment cannot be guaranteed.

Technical data Spare parts	Leaflet No. 3865 No. 9410	Technical data SH5M Installation and maintenance SH5M Spare parts SH5M	Leaflet No. 3865-M No. 8410-M No. 9410-M	11/04	8/10
				8410	

If the instructions in this manual are not adhered to, the performance, correct operation and the safety of the equipment cannot be guaranteed.

Technical data Spare parts	Leaflet No. 3865 No. 9410	Technical data SH5M Installation and maintenance SH5M Spare parts SH5M	Leaflet No. 3865-M No. 8410-M No. 9410-M	11/04	8/10
				8410	

Disc brake - SH5

Installation and maintenance

7-4 Periodic checking

- Avoid deposits of oil or grease on the disc or pads and make sure that maximum protection from all possible dirt is ensured.
- Monitor the state of the disc surface.
- Monitor the state of the pads.
- Remove brake pads from calipers that are neither operated for a long time nor stored in a protected area (store pads in a dry place).

7-5 Optional wear proving switch setting (fig. 10)

NOTE!

Its setting is only necessary when replacing the switch sub assembly.
First of all, the caliper had to be set to its nominal gap (see chapter 6-2)

The setting is performed on calipers closed on the disc (no pressure)
The setting performed is still accurate after adjusting the lining wear or changing the pads. It is true only if, after any of those operations, the gap between disc and linings is set again to its nominal value.

- Switch off the brake
- Remove the switches protection cap (15.5)
- Unscrew the counter nut (12.3)
- Slide between the stop washer (12.2) and the switch head a thickness gauge of the desired value (1 mm)
- Screw in slowly the stop washer (12.2) until the switch operates. Lock with the counter nut (12.3)
- Remove the gauge and fit back the protection cap (15.5).

7-6 Brake reconditioning

For brakes featuring a 1 mm nominal gap per side, proceed with reconditioning after 200 000 actuations or 5 years, in order to insure intrinsic performances.
Proceed also with oil replacement using an absolute 5µm filtering equipment.

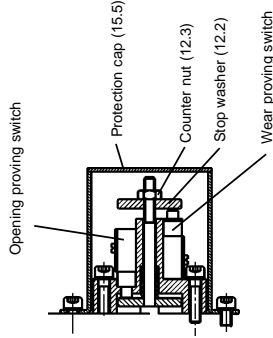


Fig. 10

STOP
Only the use of our original spare parts can guarantee reliability of our equipment.

8- SPAREPARTS

Refer to relevant leaflet.

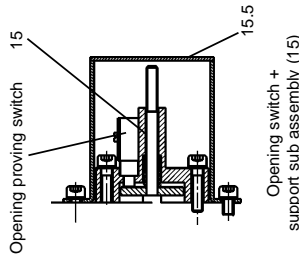
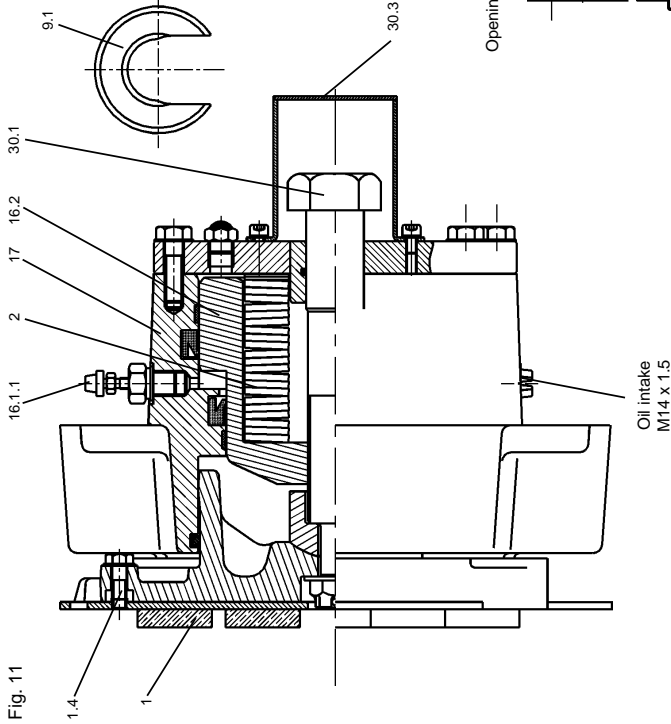
ATTENTION!

Only the use of our original spare parts can guarantee reliability of our equipment.

Disc brake - SH5

Installation and maintenance

Fig. 11



REFERENCE

- 1 Linings
- 1.4 Pad secured screw 13 mm flat spanner
- 2 Spring washer stack
- 9.1 Holding and safety washer
- 15.5 Switches protection cap 5 mm Allen wrench
- 15 Detection sub assembly:
 - with the opening proving switch
 - with the opening and wear proving switches
- 17 Jack cylinder
- 16.1.1 Bleed screw 11 mm flat spanner
- 16.2 Piston
- 30.1 setting screw 24 mm flat spanner
- 30.3 Holding cap of the setting screw 30.1 6 mm Allen wrench

If the instructions in this manual are not adhered to, the performance, correct operation and the safety of the equipment cannot be guaranteed.

Technical data	Leaflet No. 3865	Technical data SH5M	Leaflet No. 3865-M	11/04	10/10
Spare parts	No. 9410	Installation and maintenance SH5M	No. 8410-M		
		Spare parts SH5M	No. 9410-M		8410

4.7 STANDARD LIFTING CABLES INSTALLATION

(ECL Document 1-10-714-82 rev.01 of 15/06/2010)

1. INSTRUCTIONS BEFORE CABLES INSTALLATION

Before cables installation, ensure the correct conditions of the lifting drum, return pulleys, balancing cross-bar, overload (no wear and tear of the gorges). Clean and grease the gorges of drums and pulleys with “**MOBILARMA MT**” oil or equivalent.

2. LIFTING CABLES UNWINDING

- Before cable unwinding, clean the ground assembling area.
- Avoid leaving the cable laying on the ground (if necessary use wedges).
- Unwind the cable as described on figure below.
- When unwinding, check the cable condition (visual check, lubrication,.....) for the local regulations.

The cable must completely be unwinded and spread on the ground (or preferably on wedges) before assembly on lifting drum.

3. CABLE FIXING ON DRUM AND ON BALANCE CROSS-BAR

3.1. PRECAUTIONS



WARNING (Drum equipped with wedge box)

**Check the correct correspondence of the wedge with the wedge box.
If the wedge does not enter freely into wedge box, grind the wedge faces.**



WARNING (Drum equipped with cable clamps)

**Check the correct correspondence of the cable clamps / drum and cable.
The 3 cable clamps must IMPERATIVELY be installed.**

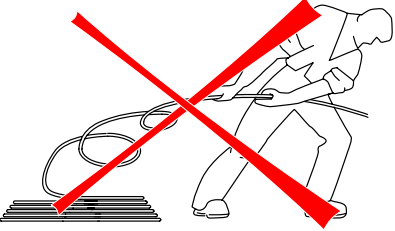
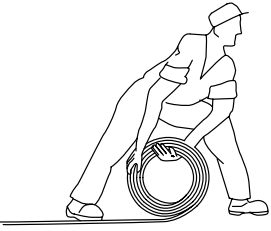
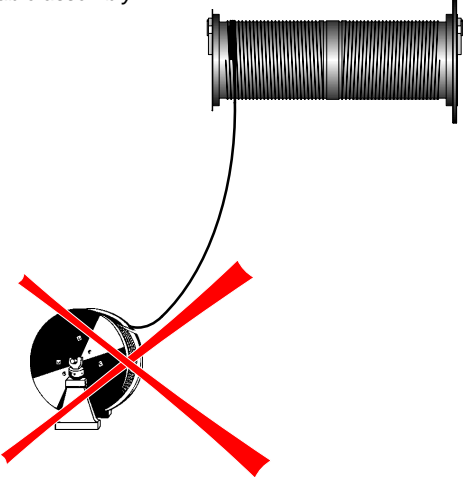
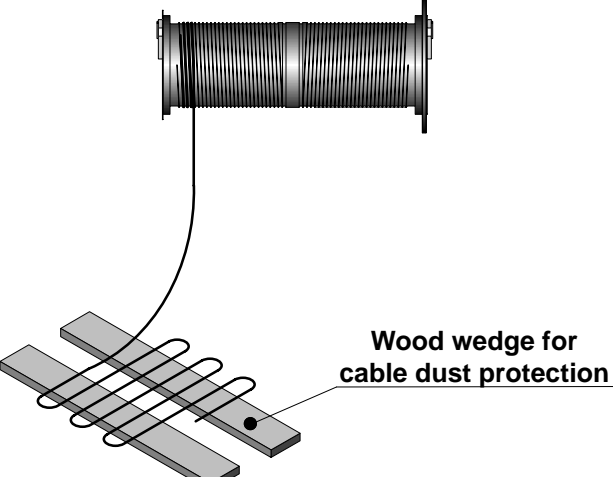
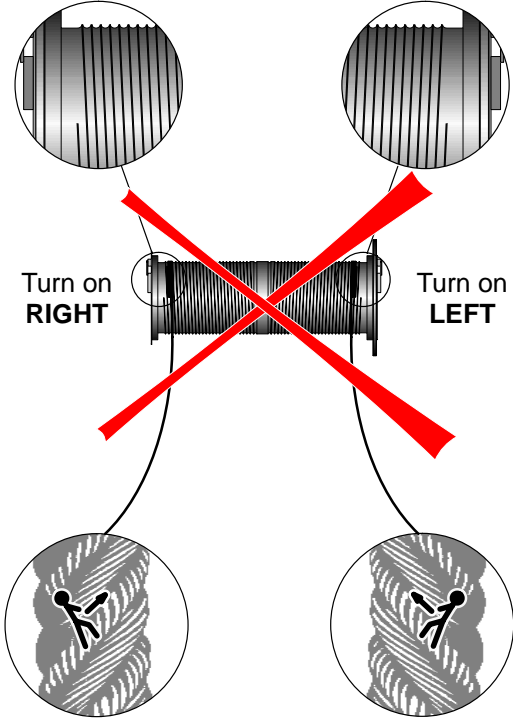


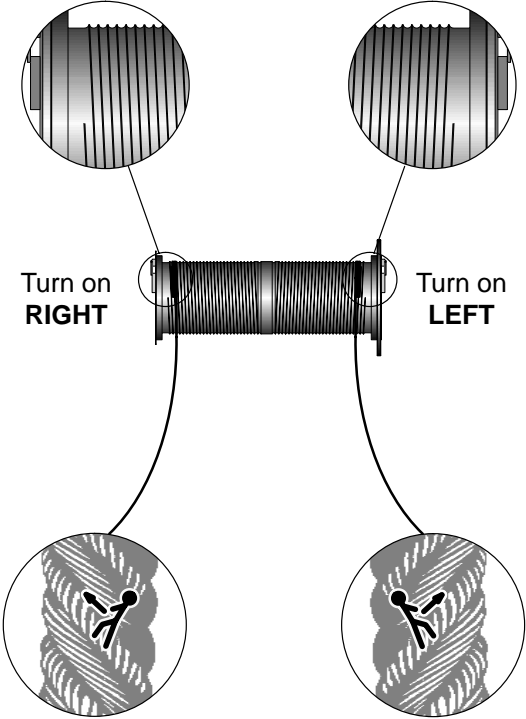


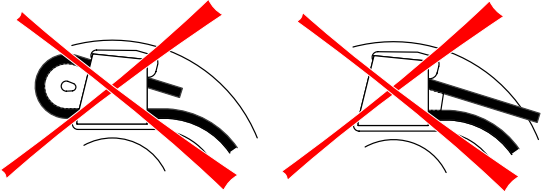
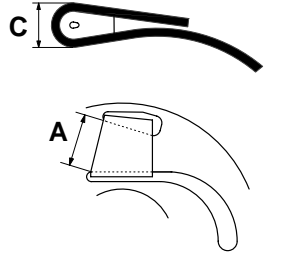
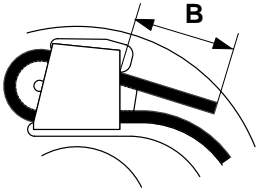
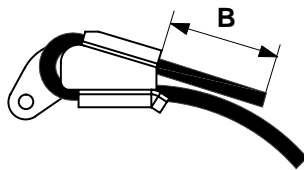
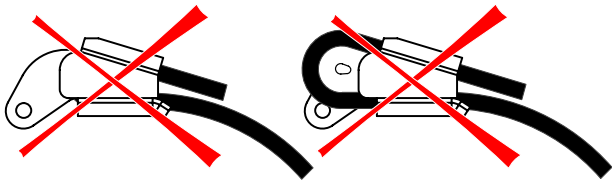
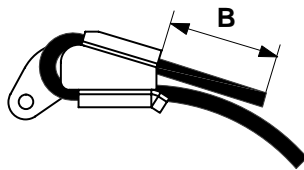
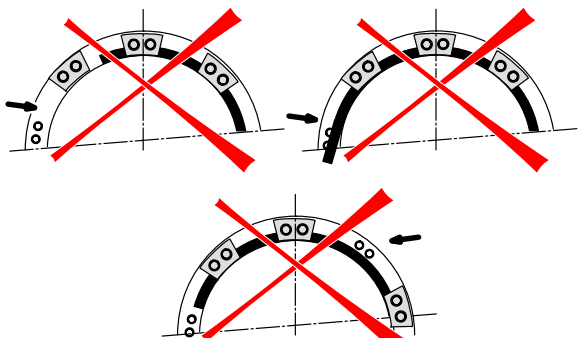
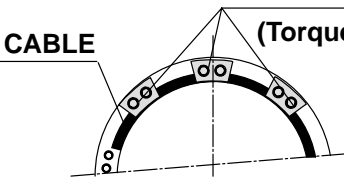
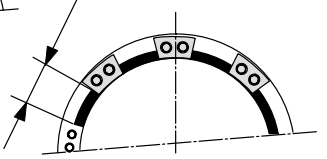
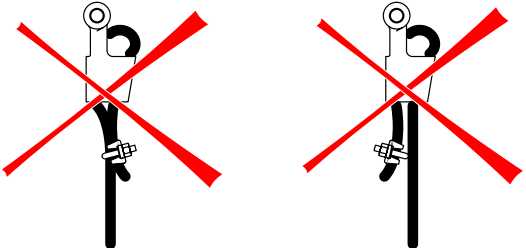
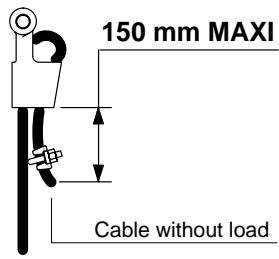
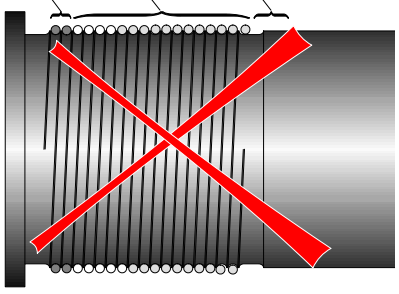
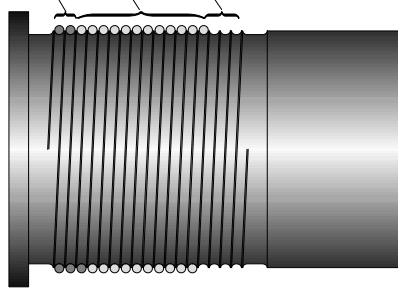
CAUTION

Respect the cable fitting way in wedge box

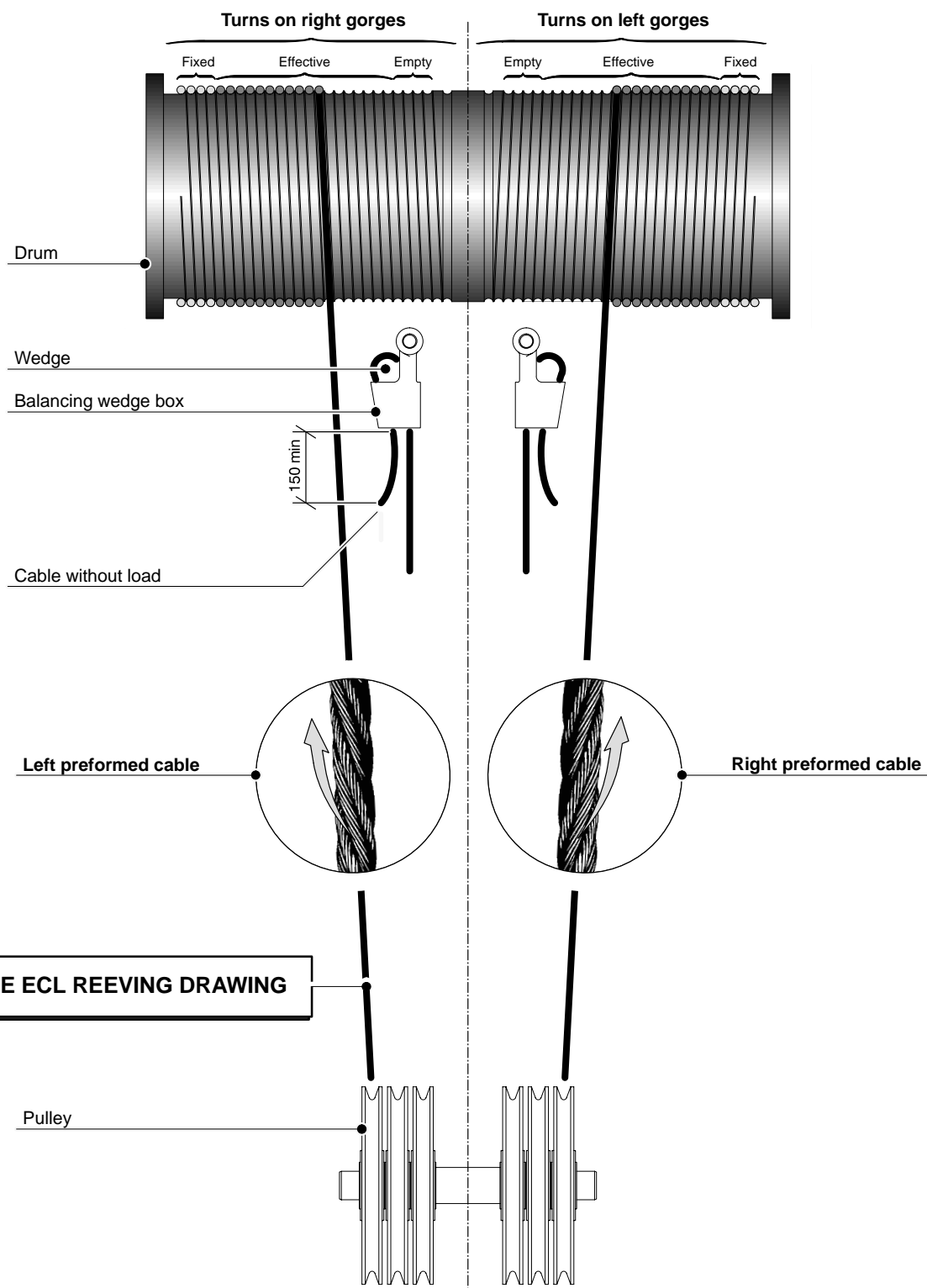
3.2. LIFTING CABLE FIXATION NOTICE

The rule of drum cable fixing, applies to the balance cross-bar cable fixing and vice versa.

Incorrect !	Correct !
<p><i>Lifting cable unwinding</i></p> 	
<p><i>Lifting cable assembly</i></p> 	 <p>Wood wedge for cable dust protection</p>
<p><i>Lifting cable mounting</i></p>  <p>Turn on RIGHT</p> <p>Turn on LEFT</p> <p>RIGHT preformed</p> <p>LEFT preformed</p> <div> <p>I go up ... ()</p> <p>Turn on RIGHT</p>  <p>Turn on LEFT</p> </div>	 <p>Turn on RIGHT</p> <p>Turn on LEFT</p> <p>LEFT preformed</p> <p>RIGHT preformed</p>

Incorrect !	Correct !
	<div> $A = C \begin{matrix} 0 \\ -2 \end{matrix}$  </div> <div>  <p>B = 150 mm MAXI</p>  </div>
	
	<p>3 CABLE CLAMPS (Torque : see drawing)</p>  <p>50 to 150 mm MAXI</p> 
	 <p>150 mm MAXI</p> <p>Cable without load</p>
<p>EMPTY gorges (null or < 2) EFFECTIVE coils FIXED coils (< 2)</p> 	<p>EMPTY gorges (2 min) EFFECTIVE coils FIXED coils (2 min)</p> 

4. IDENTIFY THE ELEMENTS (EXAMPLE)



4.8 TAPPING TOOL LIFTING CABLES INSTALLATION

1. INSTRUCTIONS BEFORE CABLES INSTALLATION

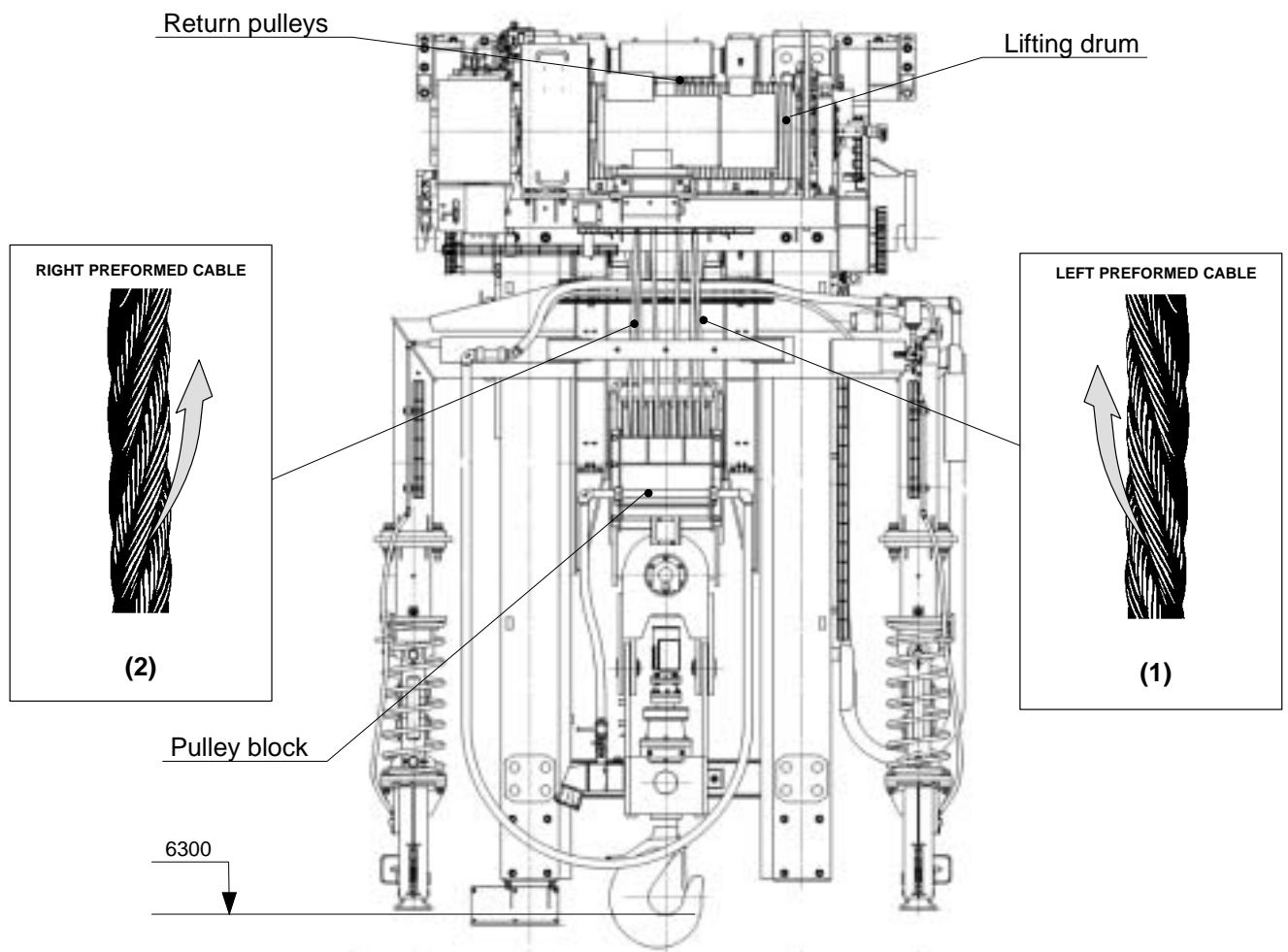
Before cables installation, refer you to the chapter "*Standard lifting cables installation*".

The tapping tool is equipped of two different lifting cables (see Figure 1 – rep 1 and 2)

- **One left preformed cable (1)** : Ø20 steel core 8x25 WS RP length = 56 m (ECL code : **1-10-533-09**)
- **One right preformed cable (2)** : Ø20 steel core 8x25 WS RP length = 56 m (ECL code : **1-10-533-07**)

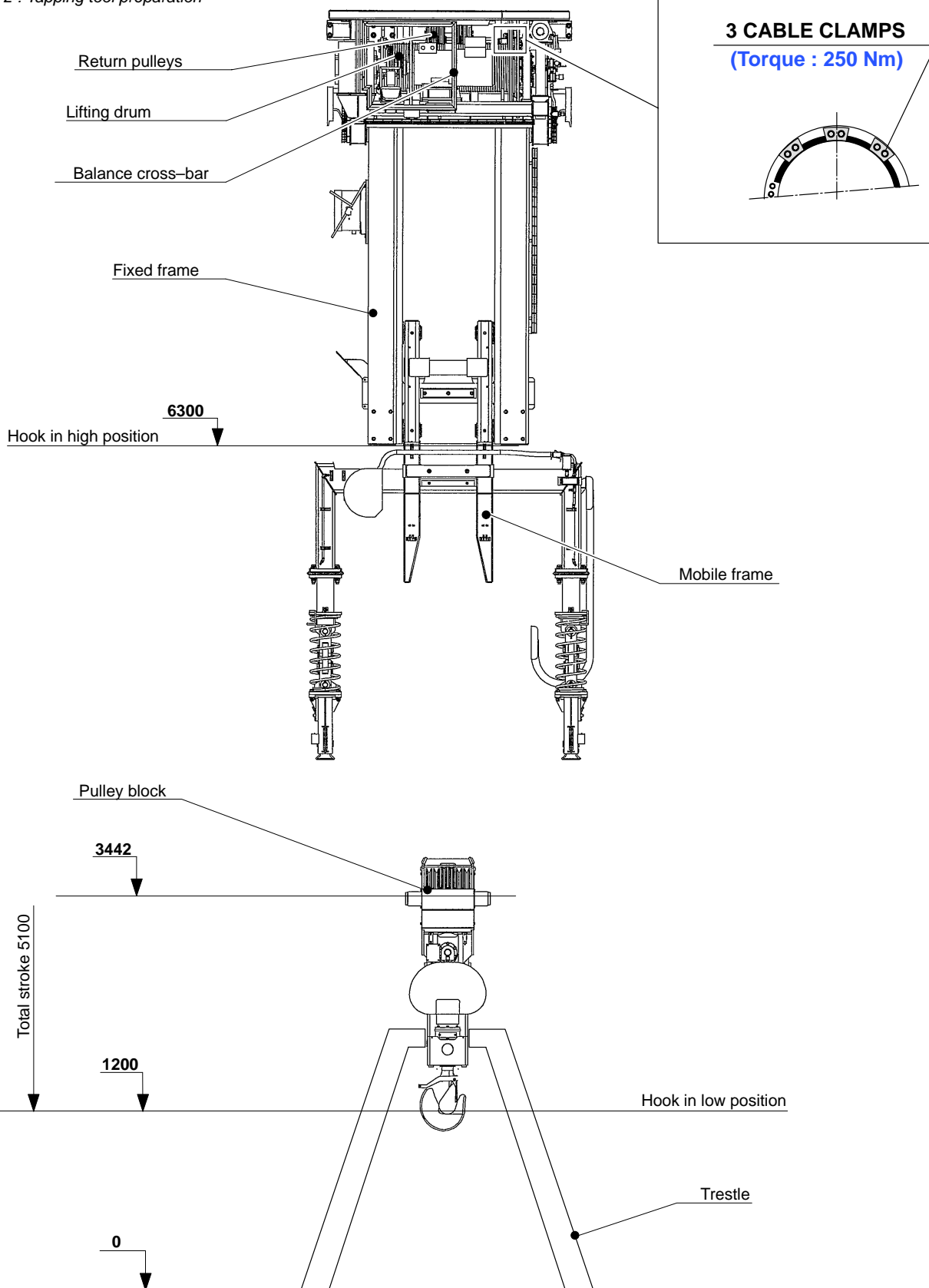
These cables will have to be installed at correct position, refering to the drawing : **1-10-893-25**

Figure 1 : Tapping tool



2. LIFTING CABLES INSTALLATION PROCEDURE AND RECOMMENDATIONS

Figure 2 : Tapping tool preparation



Before installation respect the instructions written on the reeving drawing (number of fixed coils, effective coils on the lifting drum, level...)

Put down the moving frame in contact with the stops and remove the immobilization system (fig.2).

Install the pulley block at the low level (Trestles or support fig.2).

Install the left preformed cable (safety brake side) according to the assembly order describes below (fig.3 & 4) :

- Reeving pulley (A)
- Return pulley (B)
- Reeving pulley (C)
- Return pulley (D)
- Reeving pulley (E)
- Lifting drum (F)
- Lifting drum fixing cable
- Balancing wedge box

Install the right preformed cable (moto-reducer side) according to the assembly order describes above.

After the two lifting cables installation :

- Carry out the electric connection of the hook rotation motor and dynamometric axle.
- Control the lifting motor, proceed to the adjustment of the selector switch, and overstroke limit switch.

Figure 3 : Tapping trolley reeving

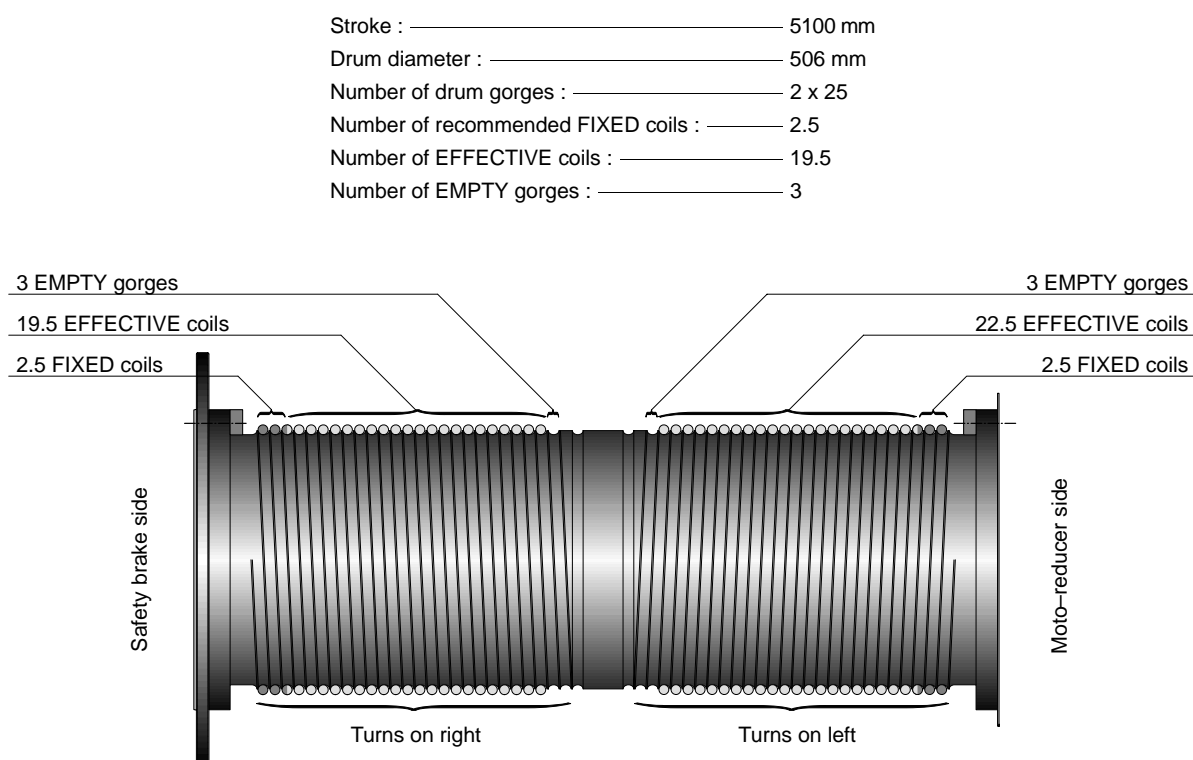
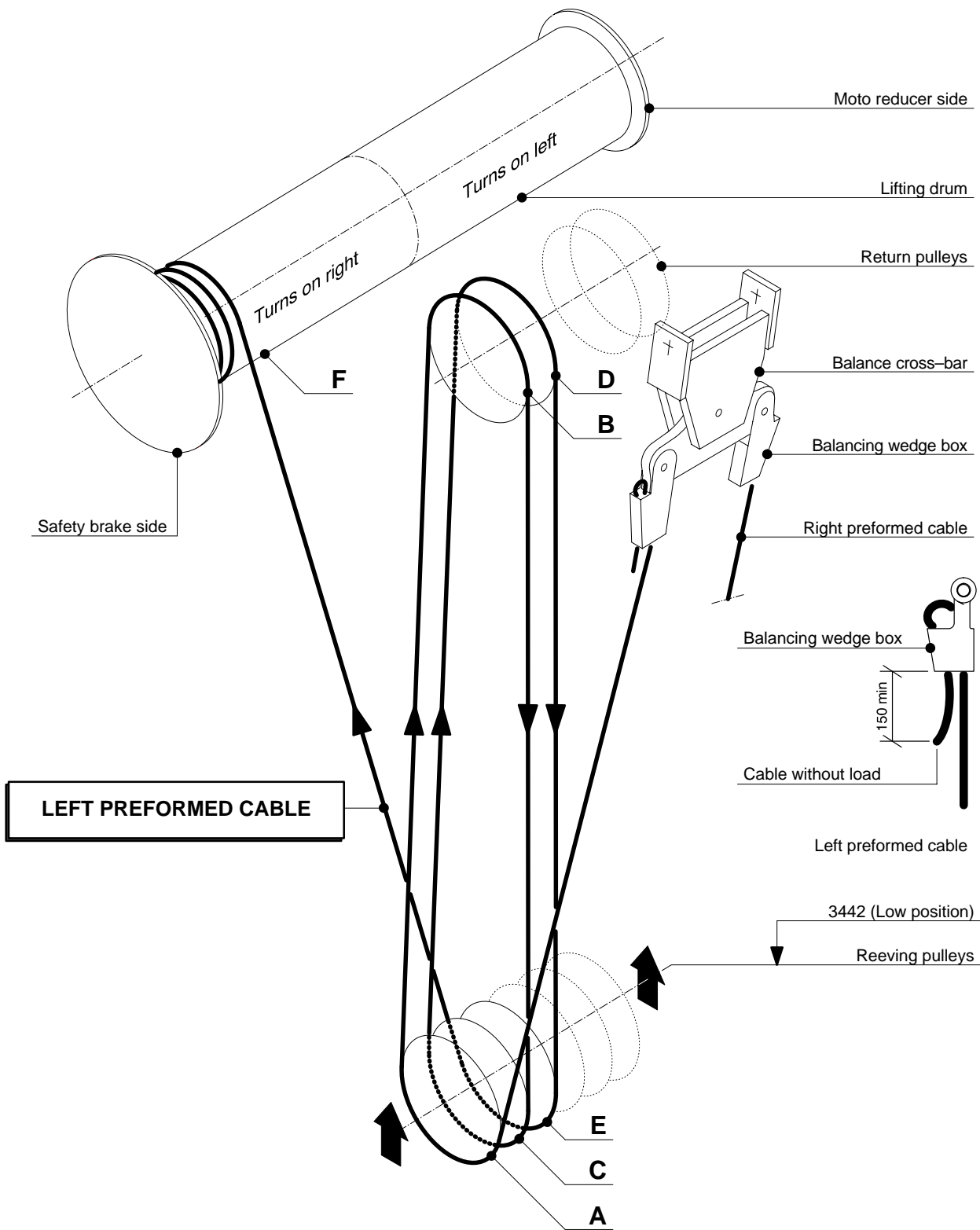


Figure 4 : Cable installation order

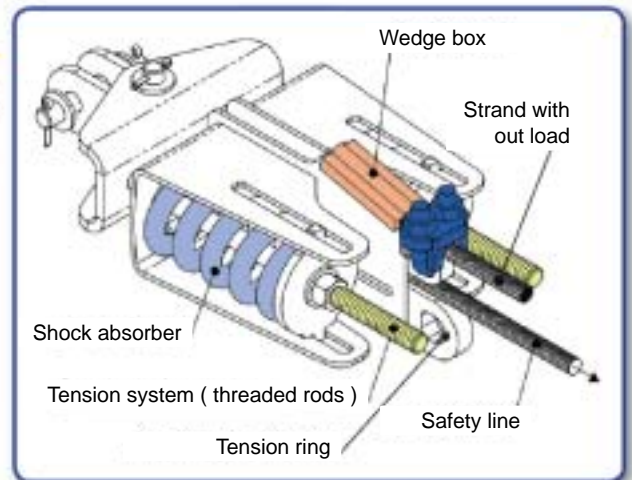


4.9 SAFETY LINE SECURIFIL OPTIMA

Location	ECL code	Reference
Long travel trolley access ass'y	1-10-669-11	Optima

① Optima block installation

After having fix the optima block at its part of end, check that the threaded rod nuts are completely unscrewed.



② Cable installation



Make a "round trip" with the cable in the empty wedge box in order to form a loop.

The strand without load must be side opposed to the tension ring.

③ Wedge installation



Introduce the wedge in the cable loop.

Draw on the strand without load until the wedge ring appears on cable side.

④ Cable wire clamp installation and cable tension adjustment



Pass the cable wire clamp in the wedge ring. Strongly tighten before slackening the cable tension. Then, cut the strand without load surplus with cautiously.

Intervene on the threaded rods to establish the cable final tension.

4.10 DRIVING WHEEL

ECL Document reference 1-10-575-12 rev 02 (01/2012)



WARNING

For all maintenance operations, the operator must have thorough knowledge of this general information. The repair operations (wheel or bearings replacement) must be carried out in maintenance workshop after dismantling of the complete assembly (idle or driving wheel).

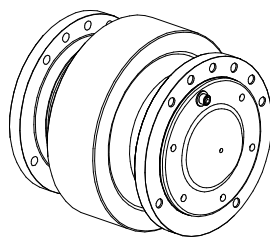
- Before all dismantling operation ensure the safety conditions and respect the safety rules in effect on site.
- Use the assembly drawings (included in spare parts manual).
- When refitting, parts have to be completely cleaned (degrease if necessary).
- Check that no alumina dust or other foreign matter get into mechanical parts.

1. PRELIMINARY INSTRUCTIONS BEFORE DISMANTLING

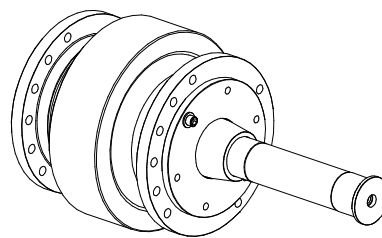
Wheels description :

There are two types of bound wheels fitted under the end truck :

- the **idle wheels**
- the **driving wheels** driven by a moto-reducer coupled with wheel shaft by means of a shrink disc.

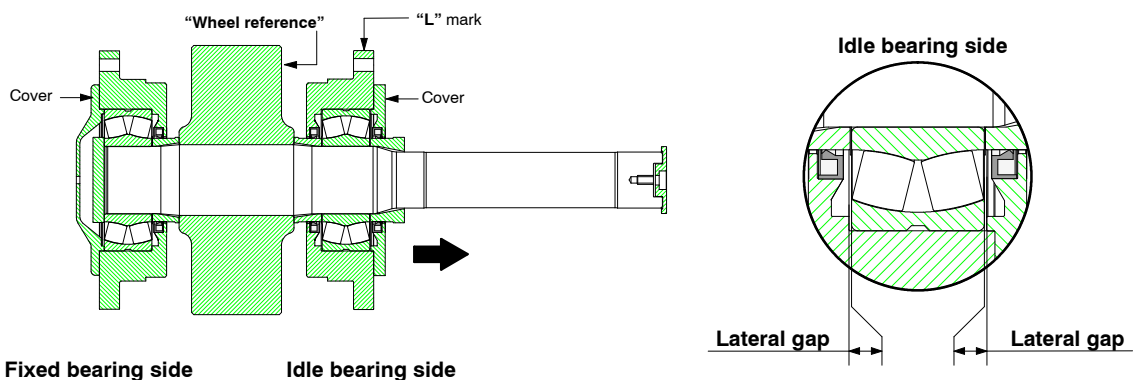


Idle wheel



Driving wheel

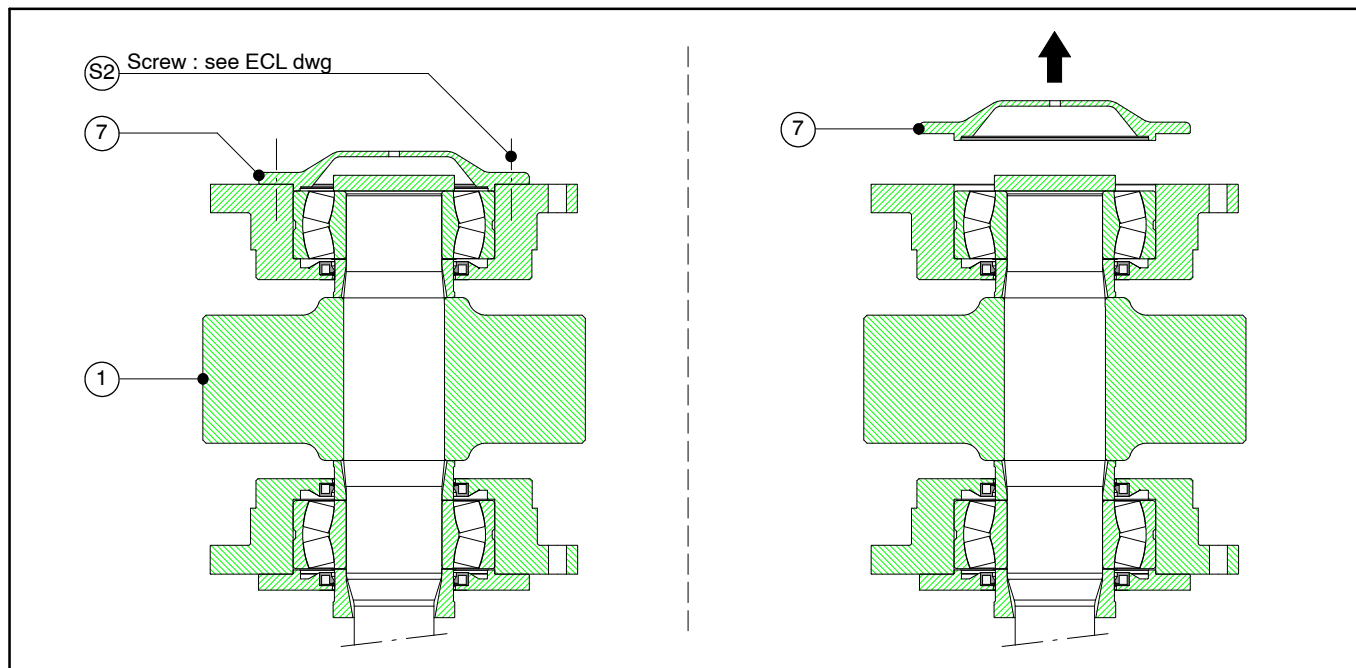
Each wheel is equipped of two bearings, **idle and fixed bearings**. The idle bearing is assembled on the side where the wheel reference is marked. The bearing housing with the "L" mark is on the idle bearing side. The bearing is set idle by its cover (different size). **DO NOT MIX the covers when dismantling !** (for idle wheel)



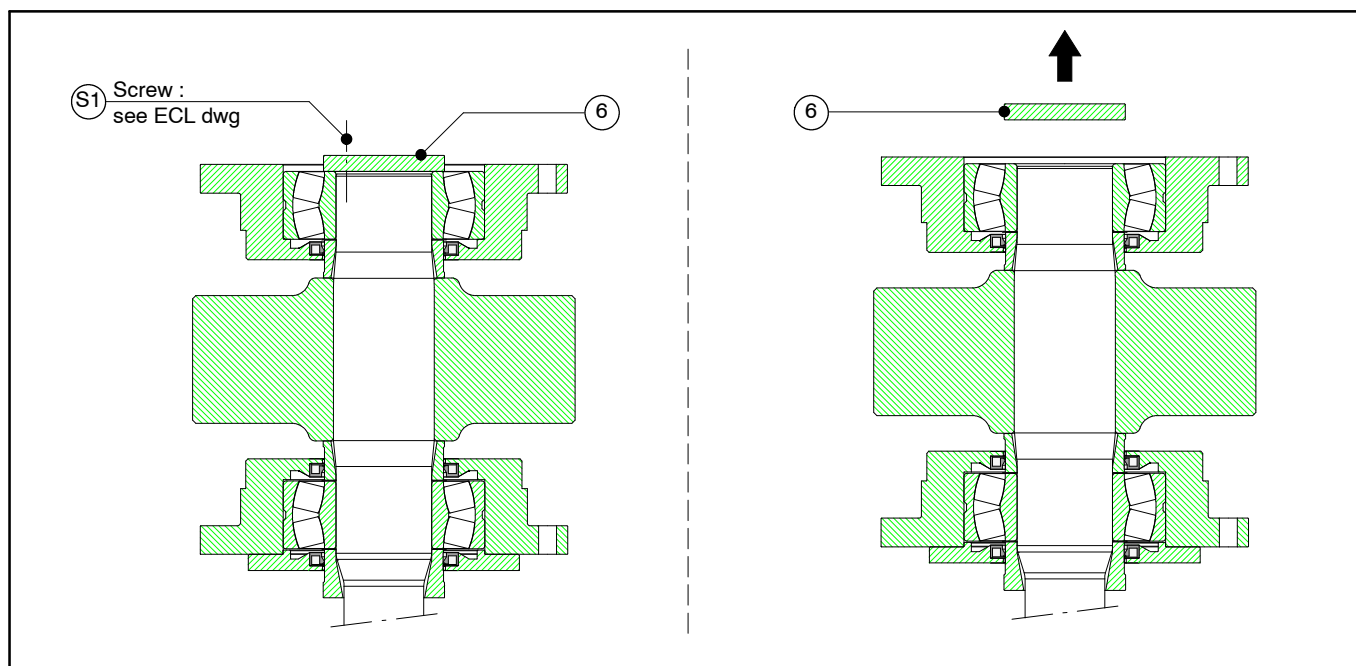
2. DRIVING WHEEL DISMANTLING

- First bearing box dismantling :

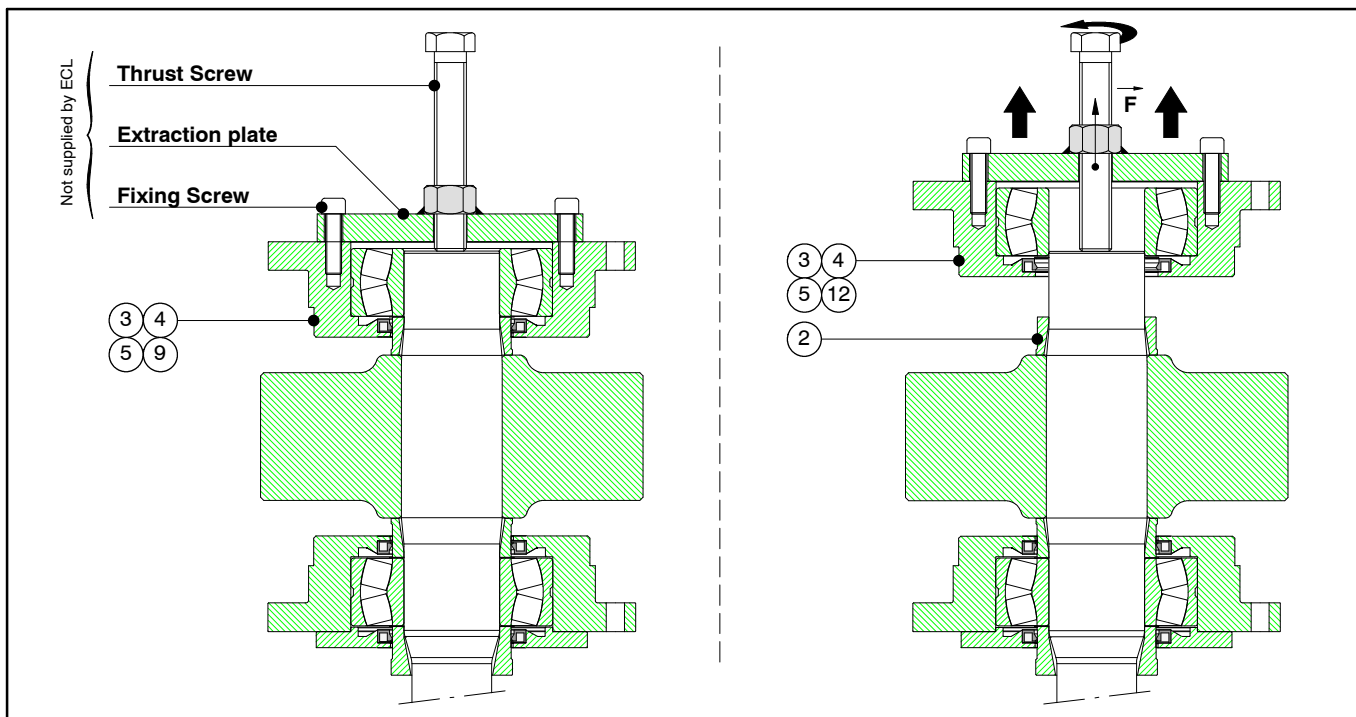
- Install the driving wheel to be dismantled on a support in order to immobilize the wheel (1), (no rotation).
- Remove the cover (7) by unscrewing the six screws (S2). This screw has been fixed with Loctite paste n° 222 when assembling.



- Remove the washer (6) by unscrewing the three screws (S1). This screw has been fixed with Loctite paste n° 222 when assembling.



- Remove the bearing housing (3 + 4 + 5 + 12), as described here after (see values table 1).
- Remove the spacer (2).

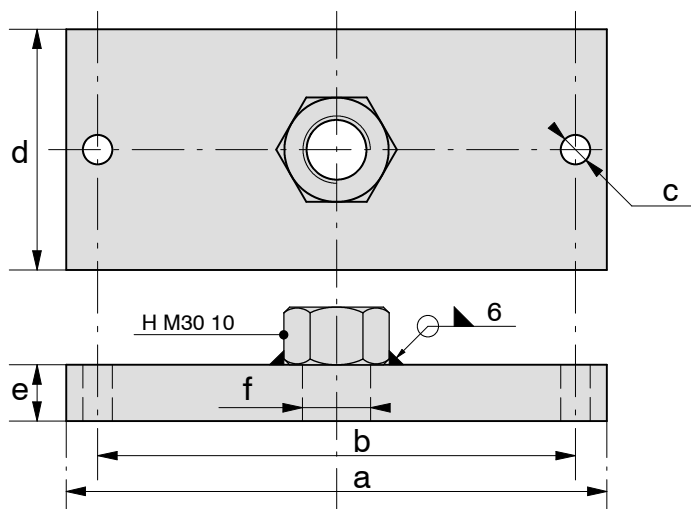


- Values table 1

Wheel Ref.	Dismantling Stress (daN)	Fixing screw (x2)	Thrust screw	Extraction Plate (mm) "E24-2"					
				a	b	c	d	e	f
dia. 300	118	CHC M12X50-8.8	H M30x130-8.8	260	198	13	120	25	31
dia. 360	176	CHC M12X45-8.8	H M30x140-8.8	280	218	13			
dia. 420	224	CHC M16X55-8.8	H M30x140-8.8	310	250	17			
dia. 480	328	CHC M16X55-8.8	H M30x150-8.8	340	276	17			
dia. 550	467	CHC M16X60-8.8	H M30x150-8.8	360	296	17			
dia. 620	878	CHC M20X60-8.8	H M30x180-8.8	425	365	21			
dia. 700	988	CHC M20X60-8.8	H M30x180-8.8	445	385	21			
Transfer gantry	330	CHC M14X55-8.8	H M30x150-8.8	340	275	15			

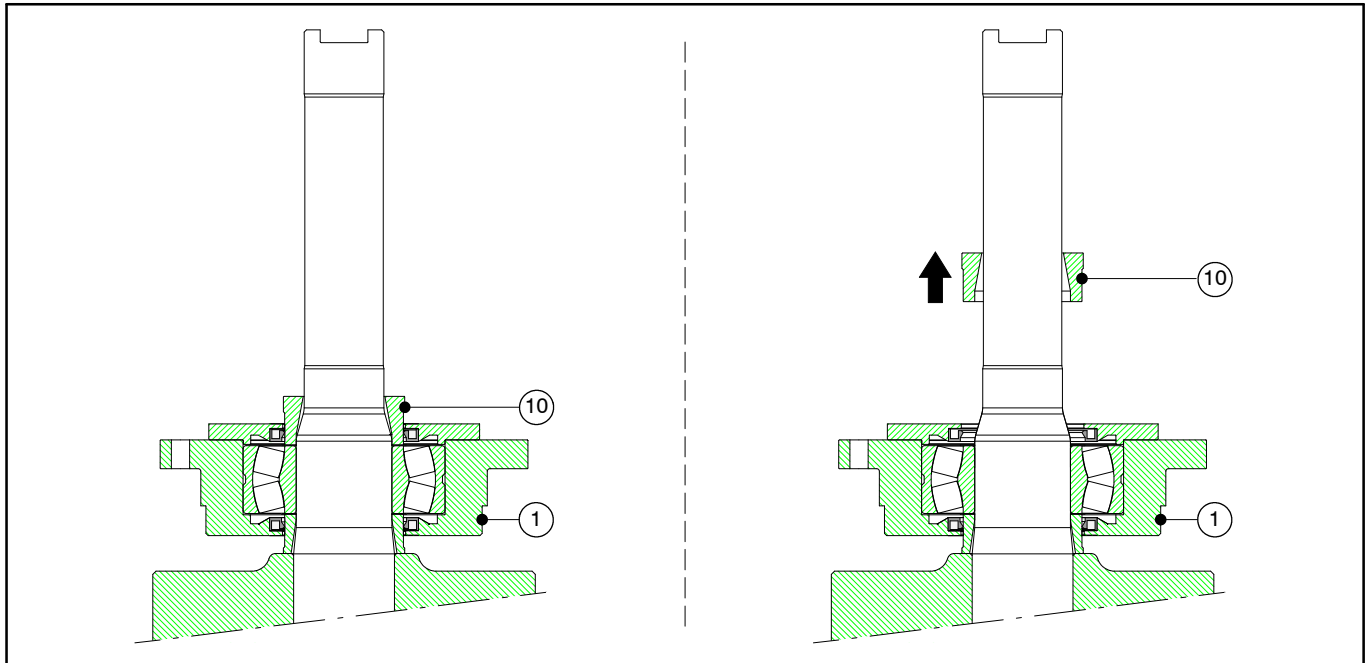
Extraction Plate

(not supplied by ECL)

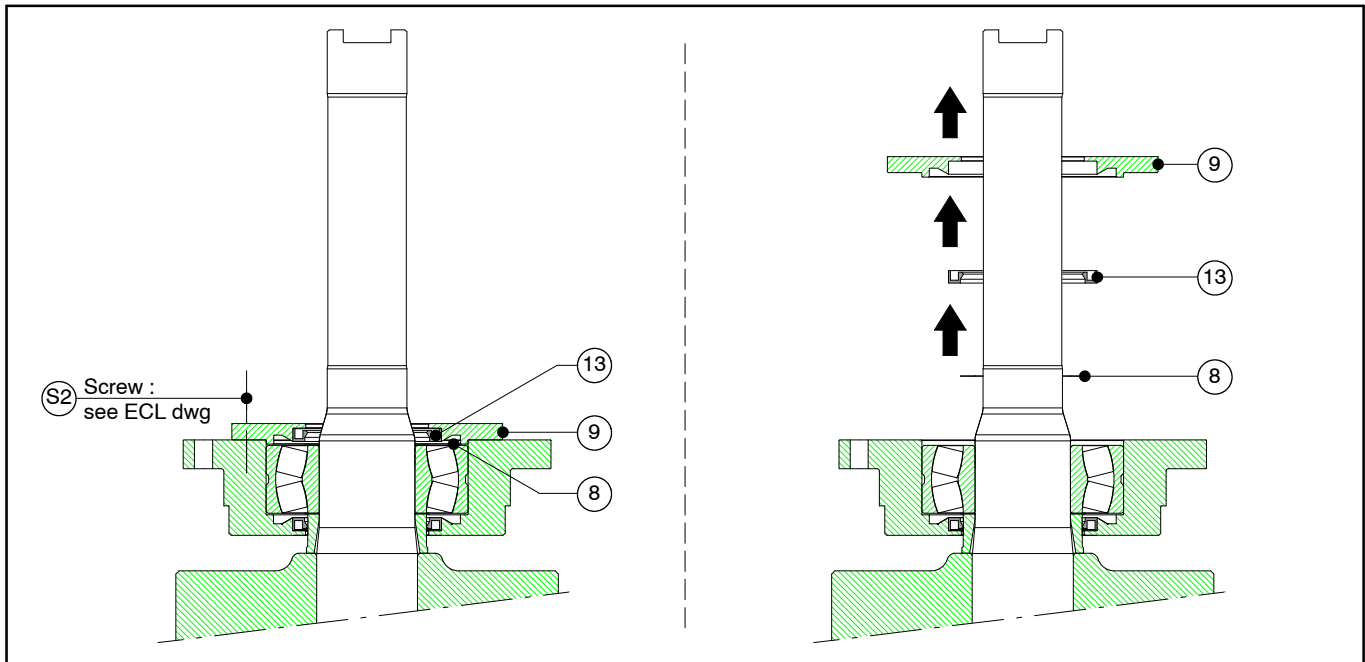


- Second bearing box dismantling :

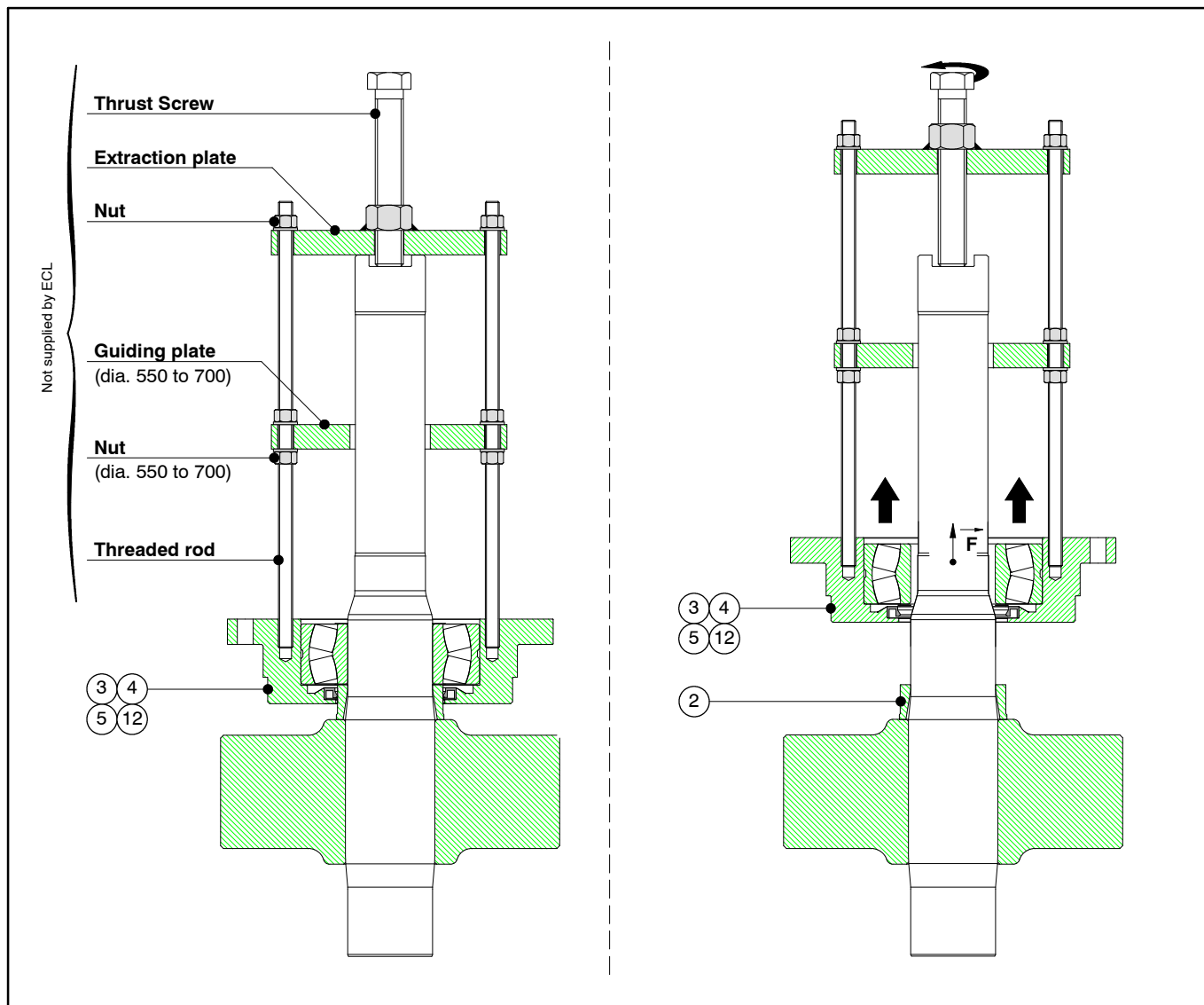
- Install the driving wheel to be dismantled on a support in order to immobilize the wheel (1), (no rotation).
- Remove the spacer (10).



- Remove the cover (9) and the lip seal (13) by unscrewing the six screws (S2). This screw has been fixed with Loctite paste n° 222 when assembling.
- Remove the shim (8).



- Remove the bearing housing (3 + 4 + 5 + 12), as described here after (see values table 2 & 3).
- Remove the spacer (2).



- Values table 2

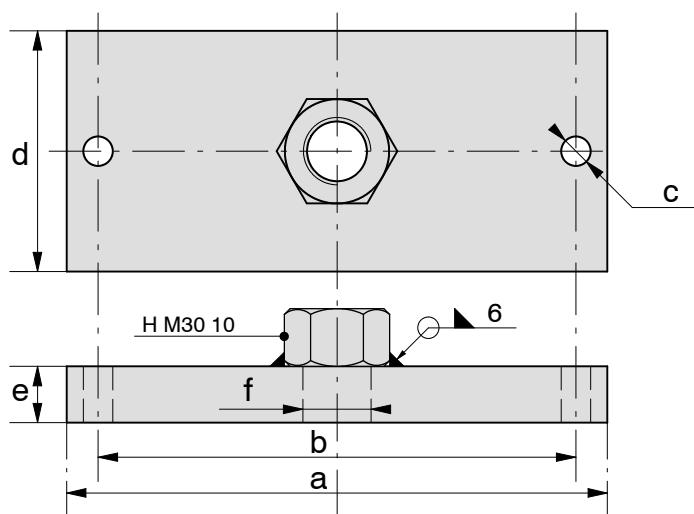
Wheel Ref.	Dismantling Stress (daN)	Threaded Rod (x2)	Nut	Thrust screw
dia. 300	118	M12X450-8.8	(x2) H M12 10	H M30x130-8.8
dia. 360	176	M12X450-8.8	(x2) H M12 10	H M30x140-8.8
dia. 420	224	M16X560-8.8	(x2) H M16 10	H M30x140-8.8
dia. 480	328	M16X560-8.8	(x2) H M16 10	H M30x150-8.8
dia. 550	467	M16X630-8.8	(x6) H M16 10	H M30x150-8.8
dia. 620	878	M20X760-8.8	(x6) H M20 10	H M30x180-8.8
dia. 700	988	M20X760-8.8	(x6) H M20 10	H M30x180-8.8
Transfer gantry	330	M14X560-8.8	(x6) H M14 10	H M30x150-8.8

- Values table 3

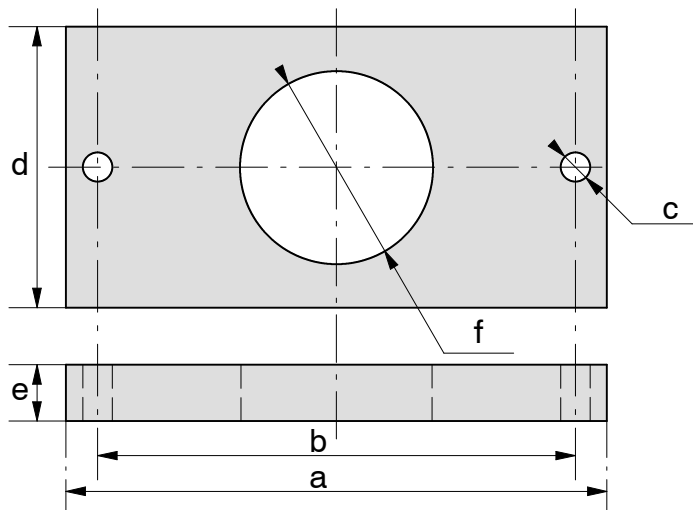
Wheel Ref.	Extraction Plate (mm) "E24-2"						Guiding Plate (mm) "E24-2"					
	a	b	c	d	e	f	a	b	c	d	e	f
dia. 300	260	198	13	120	25	31						
dia. 360	280	218	13				/	/	/	/	/	/
dia. 420	310	250	17									
dia. 480	340	276	17									
dia. 550	360	296	17				360	296	17	180	25	137
dia. 620	425	365	21				425	365	21			
dia. 700	445	385	21				445	385	21			
Transfer gantry	340	275	15				/	/	/	/	/	/

Extraction Plate

(not supplied by ECL)



Guiding Plate

(GM550 to GM820)
(not supplied by ECL)


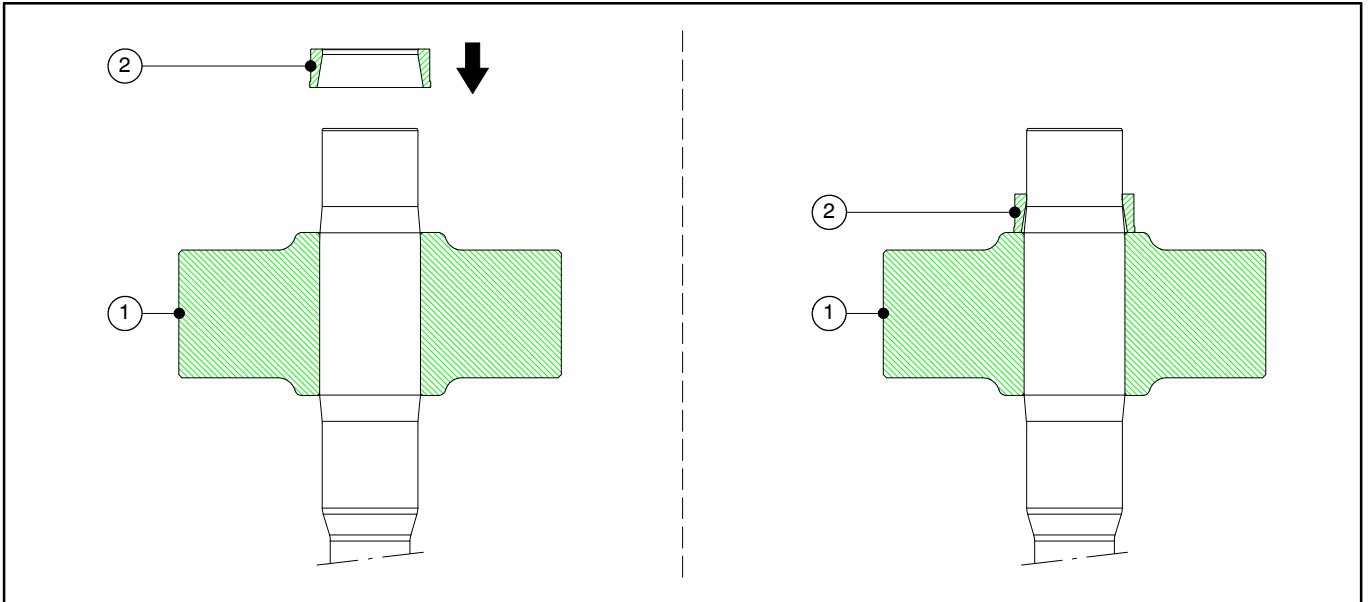
3. DRIVING WHEEL ASSEMBLING

- Preliminary instructions

- Before assembling clean and degrease all parts and contact surfaces to be assembled.
- Install the wheel (1) on a support.

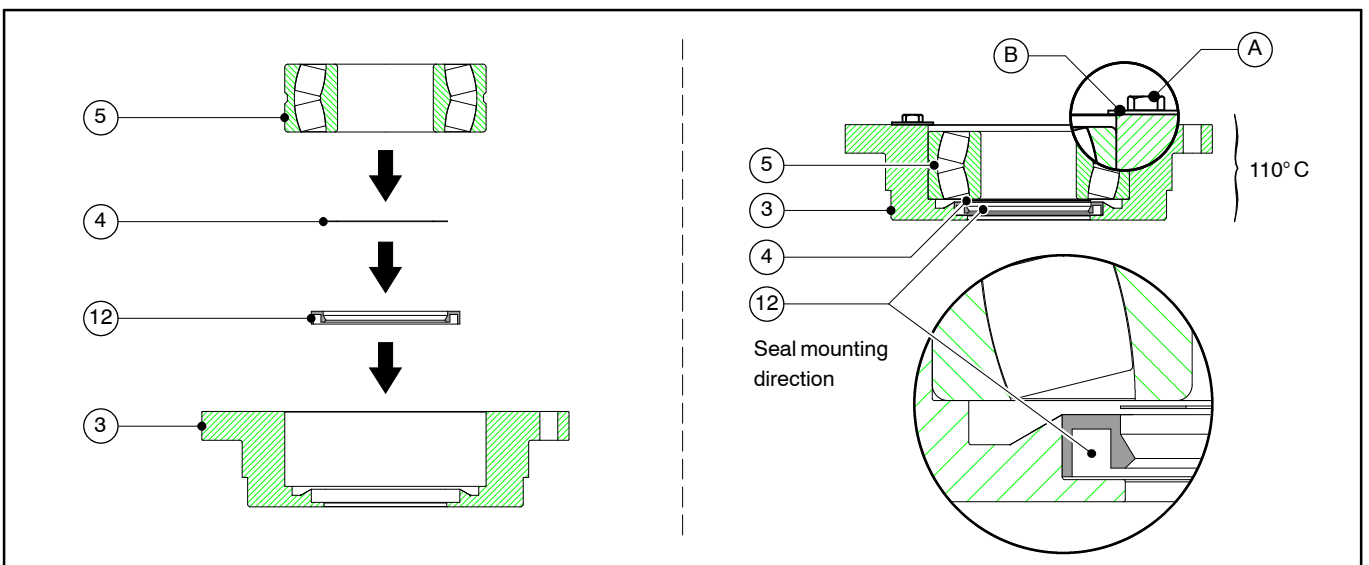
- Wheel assembling :

- Install the spacer (2) on the wheel (1). It must slip without forcing.

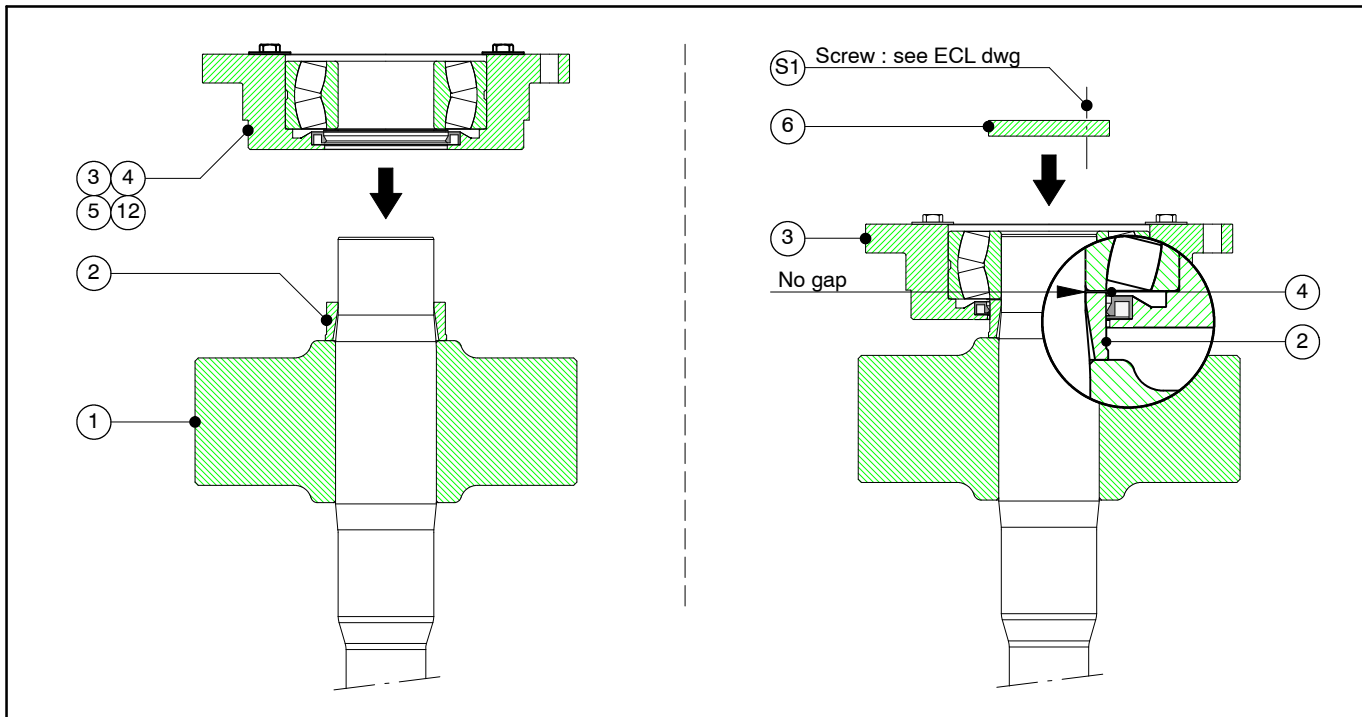


- First bearing box assembling :

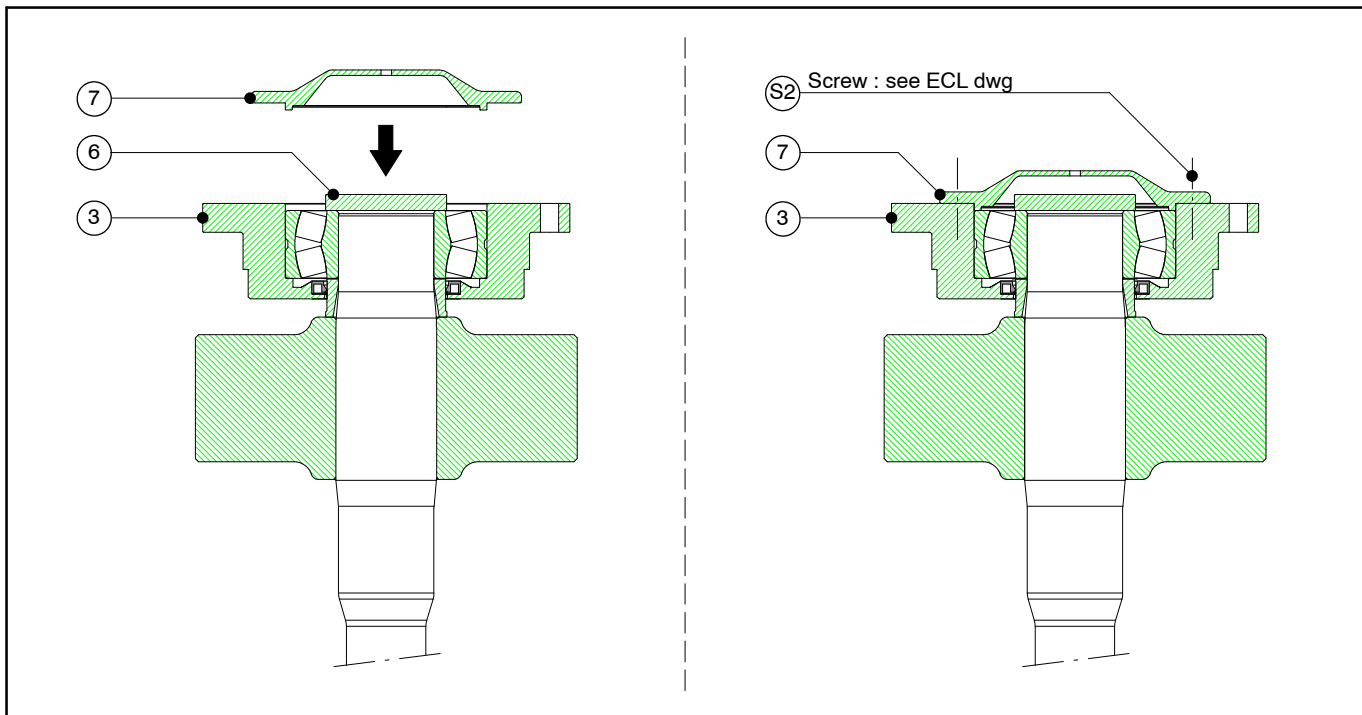
- Install the lip seal (12). **Please watch the mounting direction.**
- Install the shim (4).
- Cold assembly of the spherical roller bearing (5).
- Install two provisional screws (A) and washers (B) to maintain the lip seal (12), the shim (4) and the spherical roller bearing (5) in place during the fit.
- Heat flat the bearing housing (3) associated with the lip seal (12), the shim (4) and the spherical roller bearing (5), at 110° C.



- Hot fit the bearing housing (3 + 4 + 5 + 12) on the wheel (1), ensuring the contact between the shim (4) and the spacer (2) (no gap).
- Fix immediately the washer (6) with three screws (S1) associated with Loctite paste n° 222.

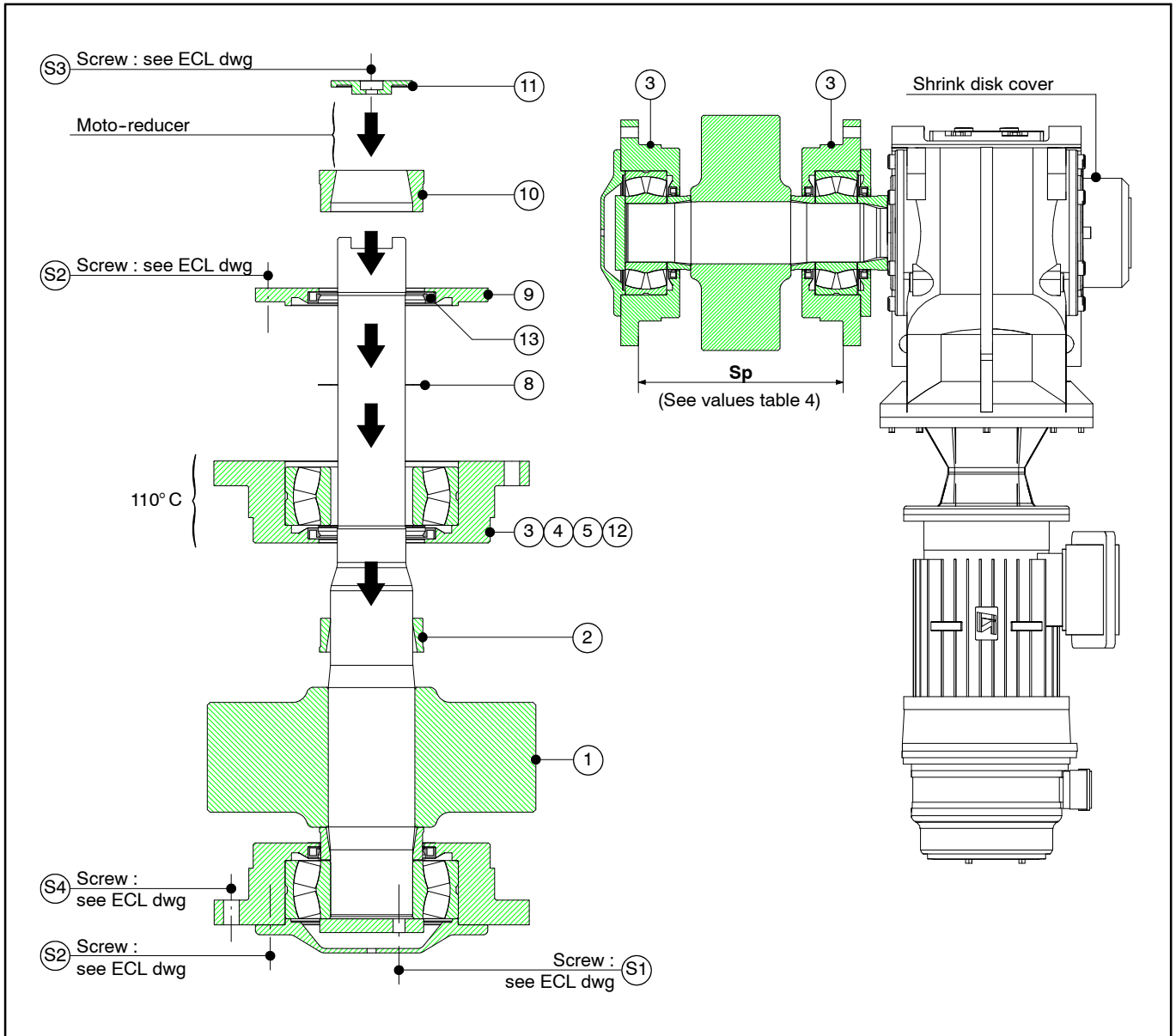


- Let bearing housing (3) cool down.
- Remove two provisional screws (A) and washers (B).
- Install the cover (7) with six screws (S2) associated with Loctite paste n° 222.



- **Second bearing box assembling :**

- Proceed in the same way for the second bearing housing assembling (shaft side) however, after the bearing housing (3 + 4 + 5 + 12) assembly :
 - Install the shim (8).
 - Install the lip seal (13) in the cover (9).
 - Install the cover (9) with the six screws (S2) associated with Loctite paste n° 222.
 - Install the spacer (10).
 - Control the spacing (Sp) between two bearing boxes (3).



- **Assembly on the trolley :**

- Install the driving wheel on the trolley with six screws (S4) then instal the moto-reducer and the spacer (11) with the screw (S3). In case of an assembly of the moto-reducer with shrink disk, tighten the screw (S3) before the tightening screws of the shrink disk.

4. LUBRICATION



WARNING

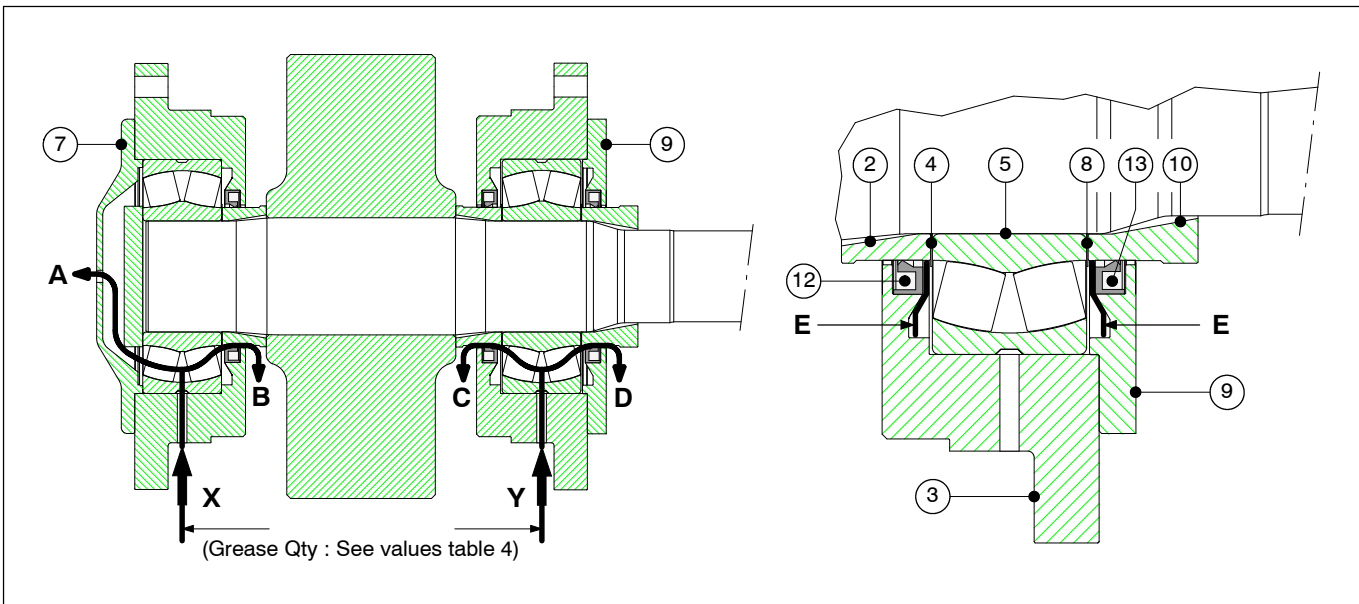
Do not lubricate more than the prescribed quantity in the values table 4 (during assembling and make up).
During grease make up, use a volumetric measurer.

4.1. LUBRICATION DURING ASSEMBLING

- **Spacer (2) lubrication before bearing housing (3) and cover (9) assembling :**
 - Lubricate lightly and smoothly the friction surface of the lip seals (12 & 13) on the spacers (2 & 10), before assembling the bearing housing (3) on the spacer (2), and before the assembling of the cover (9) on the motor side spacer (10).
- **Bottom bearing housing (3) cavity and cover (9) cavity lubrication :**
 - After the installation of the lip seals (12 & 13), lubricate the cavities (E), without excess, before the positioning of the shims (4 & 8).
- **Bearing with cover (7) lubrication :**
 - Unscrew imperatively the plug in A on the cover (7).
 - Lubricate by the point (X) until the grease comes out the point (A) or the point (B).
 - Turn the wheel with the hand during the lubrication to distribute the grease in the cavities.
 - Screw the plug in A on the cover (7).

Bearing with cover (9) lubrication (motor shaft side):

- Lubricate by the point (Y) until the grease comes out the point (C) or the point (D)
- Turn the wheel with the hand during the lubrication to distribute the grease in the cavities.



4.2. LUBRICATION DURING GREASE MAKE UP**- Bearing with cover (7) lubrication :**

- Unscrew imperatively the plug in (A) on the cover (7).
- Lubricate by the point (X) until the grease comes out the point (A) or the point (B).
- Screw the plug in (A) on the cover (7).

Bearing with cover (9) lubrication (motor shaft side) :

- Lubricate by the point (Y) until the grease comes out the point (C) or the point (D)

- Values table 4

Wheel ref.	Sp	Driving wheel weight	Grease quantity by driving wheel During assembling	Grease quantity by driving wheel During make up
dia. 300	272 ± 0.3	139 kg	960 g (2 x 480 g)	80 g (2 x 40 g)
dia. 360	312 ± 0.3	198 kg	1380 g (2 x 690 g)	100 g (2 x 50 g)
dia. 420	336 ± 0.5	292 kg	1980 g (2 x 990 g)	140 g (2 x 70 g)
dia. 480	362 ± 0.5	373 kg	2380 g (2 x 1190 g)	160 g (2 x 80 g)
dia. 550	490 ± 0.5	580 kg	2760 g (2 x 1380 g)	200 g (2 x 100 g)
dia. 620	490 ± 0.5	776 kg	3680 g (2 x 1840 g)	260 g (2 x 130 g)
dia. 700	500 ± 0.1	1132 kg	4320 g (2 x 2160 g)	300 g (2 x 150 g)
Transfer gantry	420 ± 0.2	546 kg	2040 g (2 x 1020 g)	140 g (2 x 70 g)

4.11 IDLE WHEEL

ECL Document reference 1-10-575-11 rev 02 (01/2012)



WARNING

For all maintenance operations, the operator must have thorough knowledge of this general information. The repair operations (wheel or bearings replacement) must be carried out in maintenance workshop after dismantling of the complete assembly (idle or driving wheel).

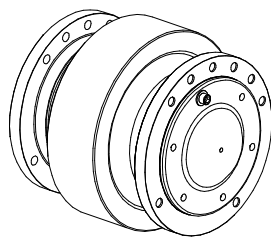
- Before all dismantling operation ensure the safety conditions and respect the safety rules in effect on site.
- Use the assembly drawings (included in spare parts manual).
- When refitting, parts have to be completely cleaned (degrease if necessary).
- Check that no alumina dust or other foreign matter get into mechanical parts.

1. PRELIMINARY INSTRUCTIONS BEFORE DISMANTLING

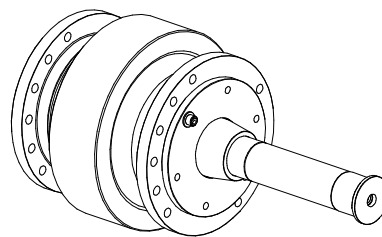
Wheels description :

There are two types of bound wheels fitted under the end truck :

- the **idle wheels**
- the **driving wheels** driven by a moto-reducer coupled with wheel shaft by means of a shrink disc.

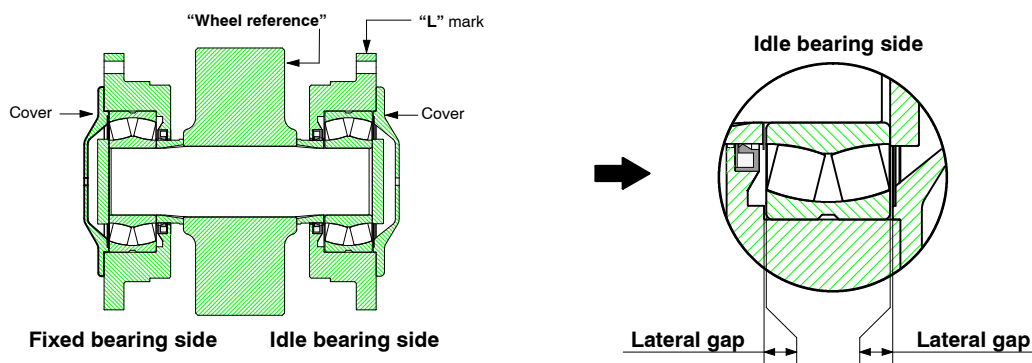


Idle wheel



Driving wheel

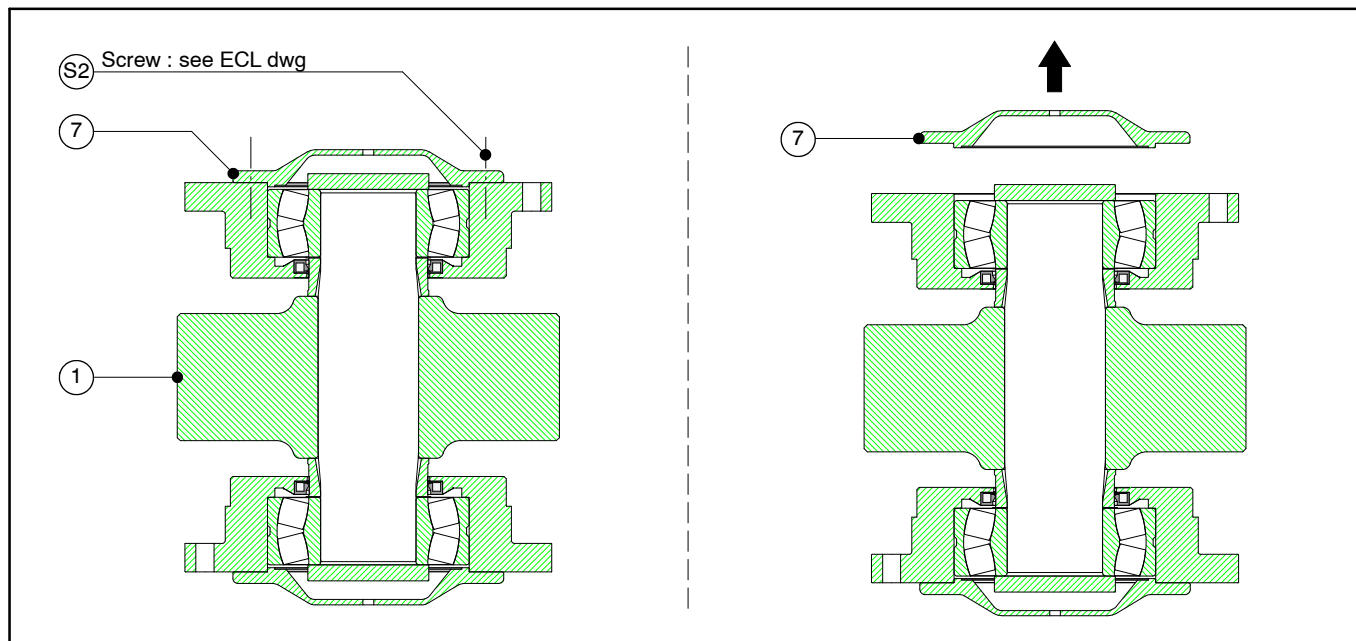
Each wheel is equipped of two bearings, **idle and fixed bearings**. The idle bearing is assembled on the side where the wheel reference is marked. The bearing housing with the "L" mark is on the idle bearing side. The bearing is set idle by its cover (different size). **DO NOT MIX the covers when dismantling !** (for idle wheel)



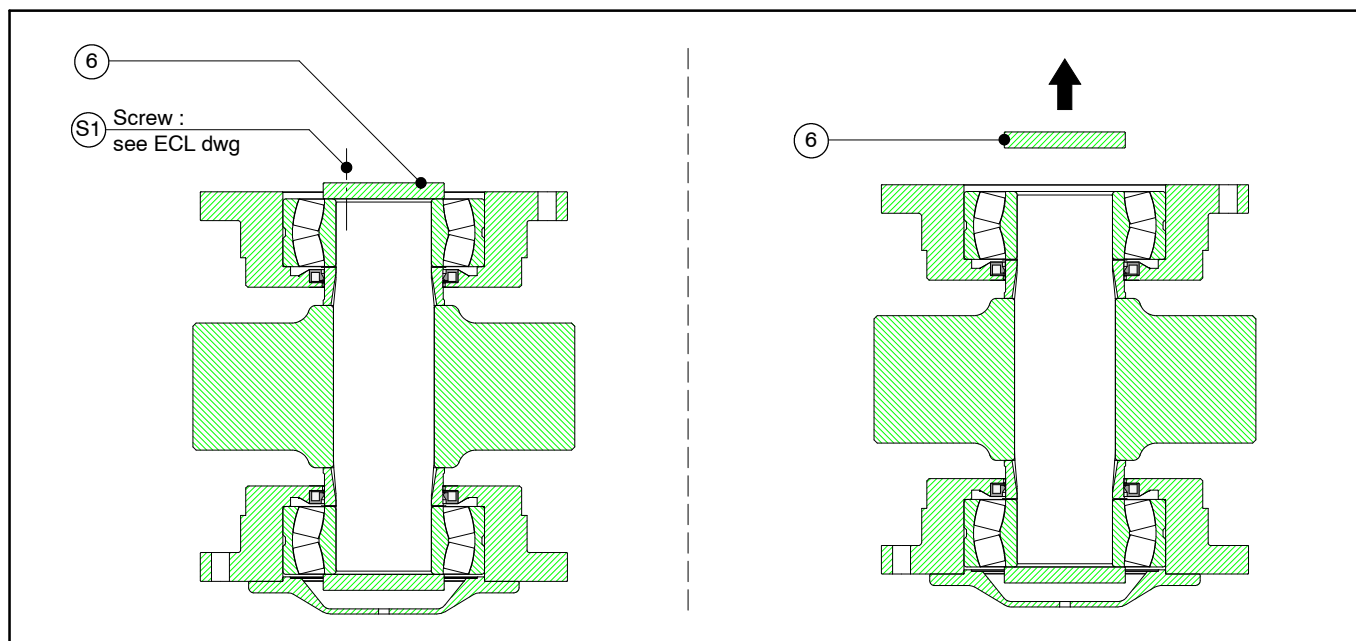
2. IDLE WHEEL DISMANTLING

- First bearing box dismantling :

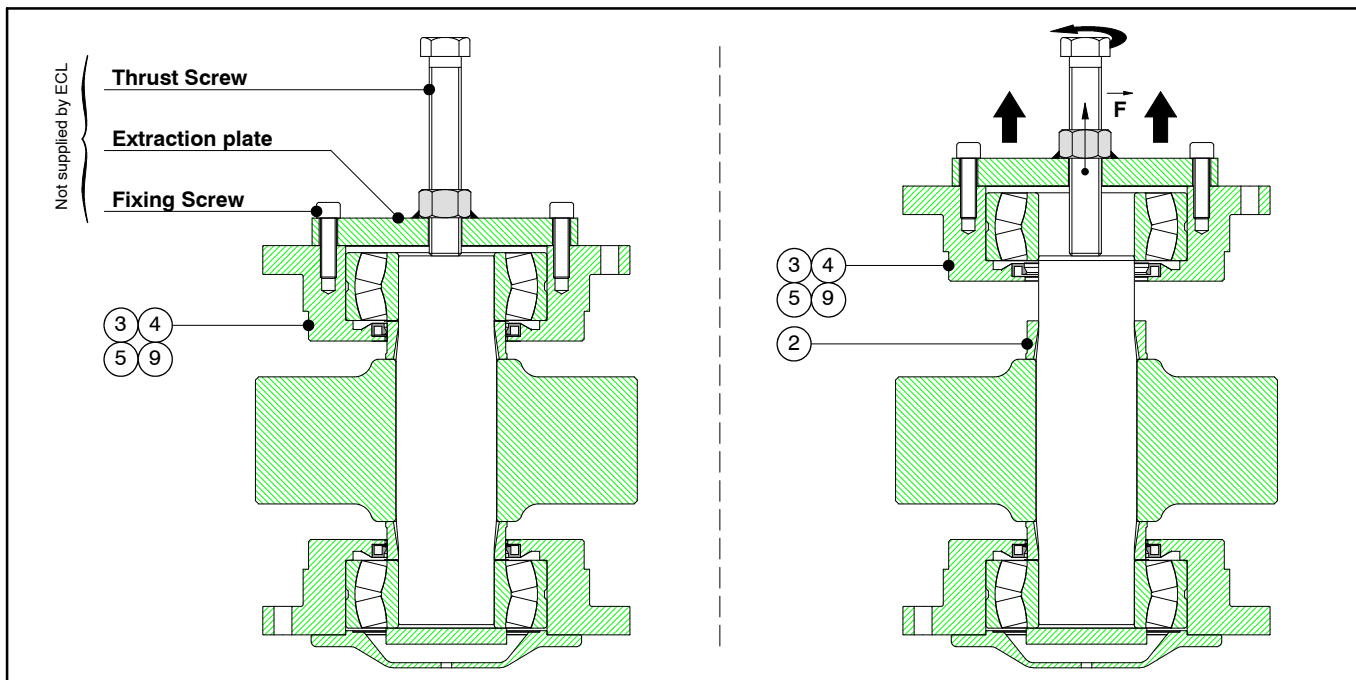
- Install the idle wheel to be dismantled on a support in order to immobilize the wheel (1), (no rotation).
- Remove the cover (7) by unscrewing the six screws (S2). This screw has been fixed with Loctite paste n° 222 when assembling.



- Remove the washer (6) by unscrewing the three screws (S1). This screw has been fixed with Loctite paste n° 222 when assembling.



- Remove the bearing housing (3 + 4 + 5 + 9), as described here after (see values table 1).
- Remove the spacer (2).

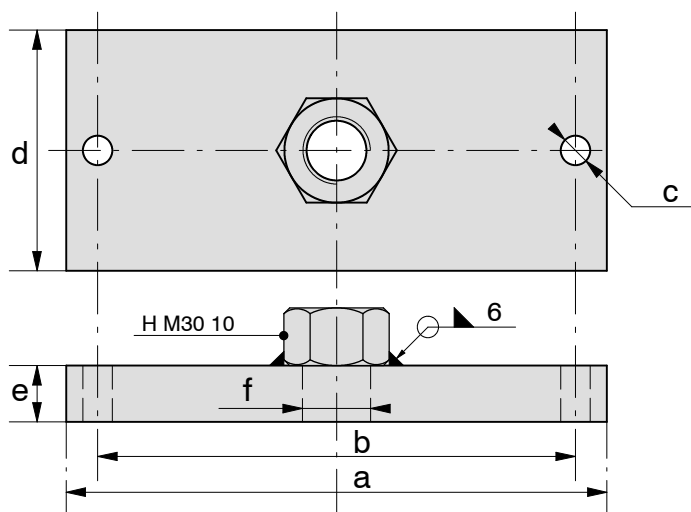


- Values table 1

Wheel Ref.	Dismantling Stress (daN)	Fixing screw (x2)	Thrust screw	Extraction Plate (mm) "E24-2"					
				a	b	c	d	e	f
dia. 300	118	CHC M12X50-8.8	H M30x130-8.8	260	198	13	120	25	31
dia. 360	176	CHC M12X45-8.8	H M30x140-8.8	280	218	13			
dia. 420	224	CHC M16X55-8.8	H M30x140-8.8	310	250	17			
dia. 480	328	CHC M16X55-8.8	H M30x150-8.8	340	276	17			
dia. 550	467	CHC M16X60-8.8	H M30x150-8.8	360	296	17			
dia. 620	878	CHC M20X60-8.8	H M30x180-8.8	425	365	21			
dia. 700	988	CHC M20X60-8.8	H M30x180-8.8	445	385	21			
Transfer gantry	330	CHC M14X55-8.8	H M30x150-8.8	340	275	15			

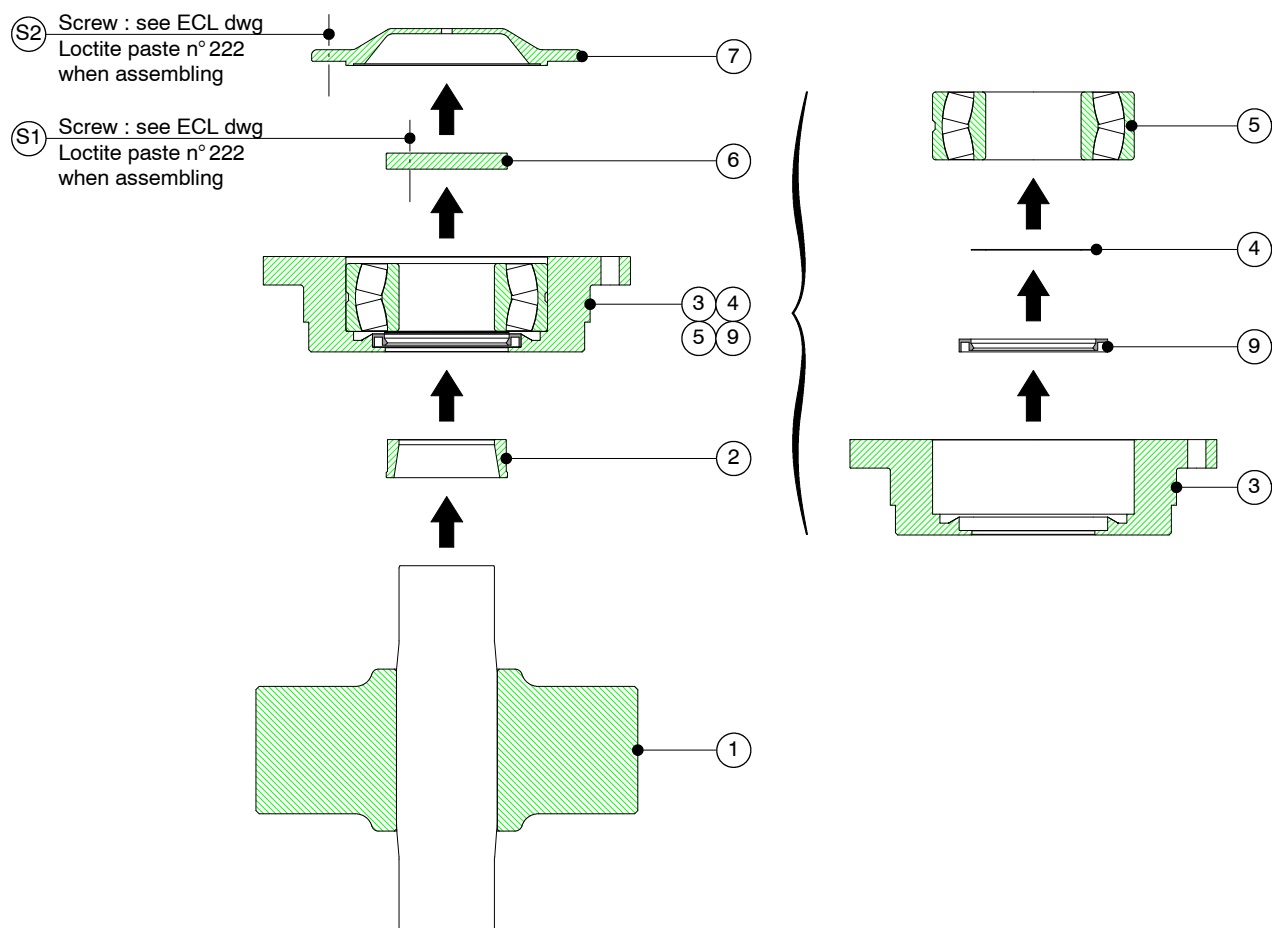
Extraction Plate

(not supplied by ECL)



- Second bearing box dismantling :

- Proceed in the same way for the second bearing housing dismantling.



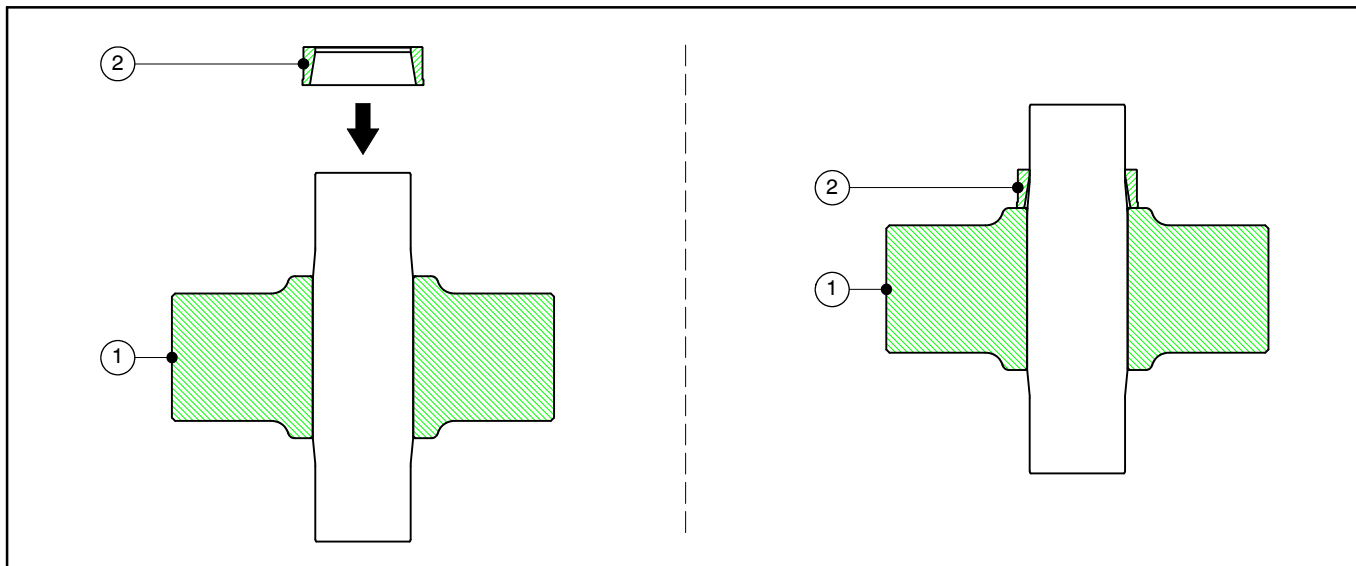
3. IDLE WHEEL ASSEMBLING

- Preliminary instructions

- Before assembling clean and degrease all parts and contact surfaces to be assembled.
- Install the wheel (1) on a support.

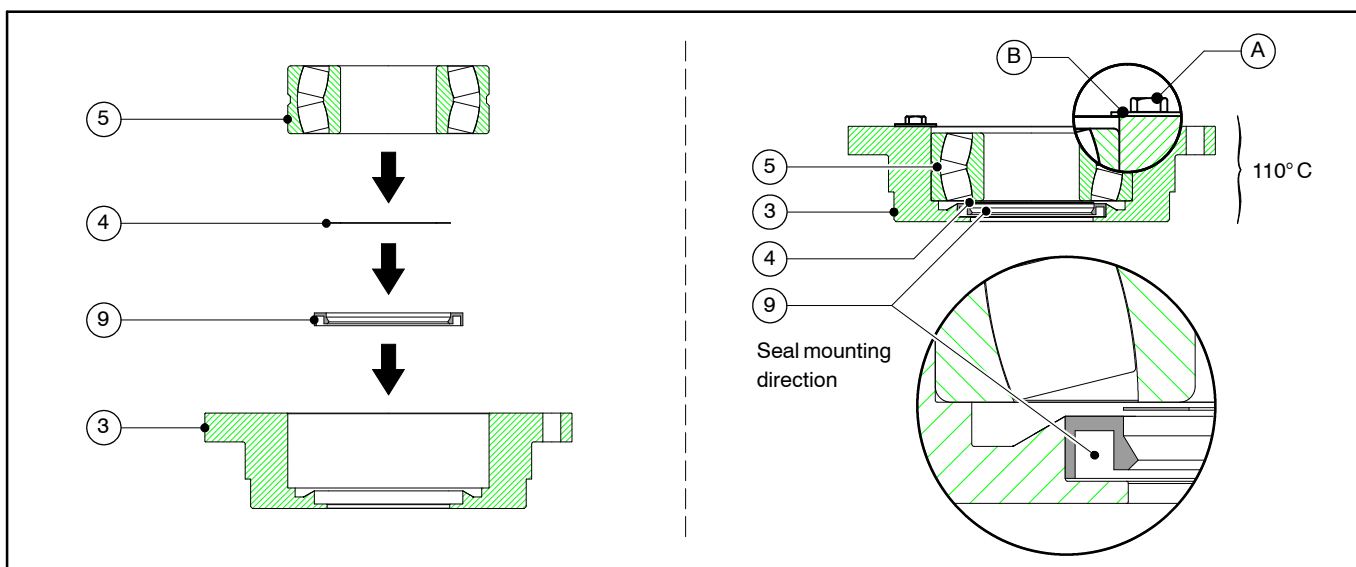
- Wheel assembling :

- Install the spacer (2) on the wheel (1). It must slip without forcing.

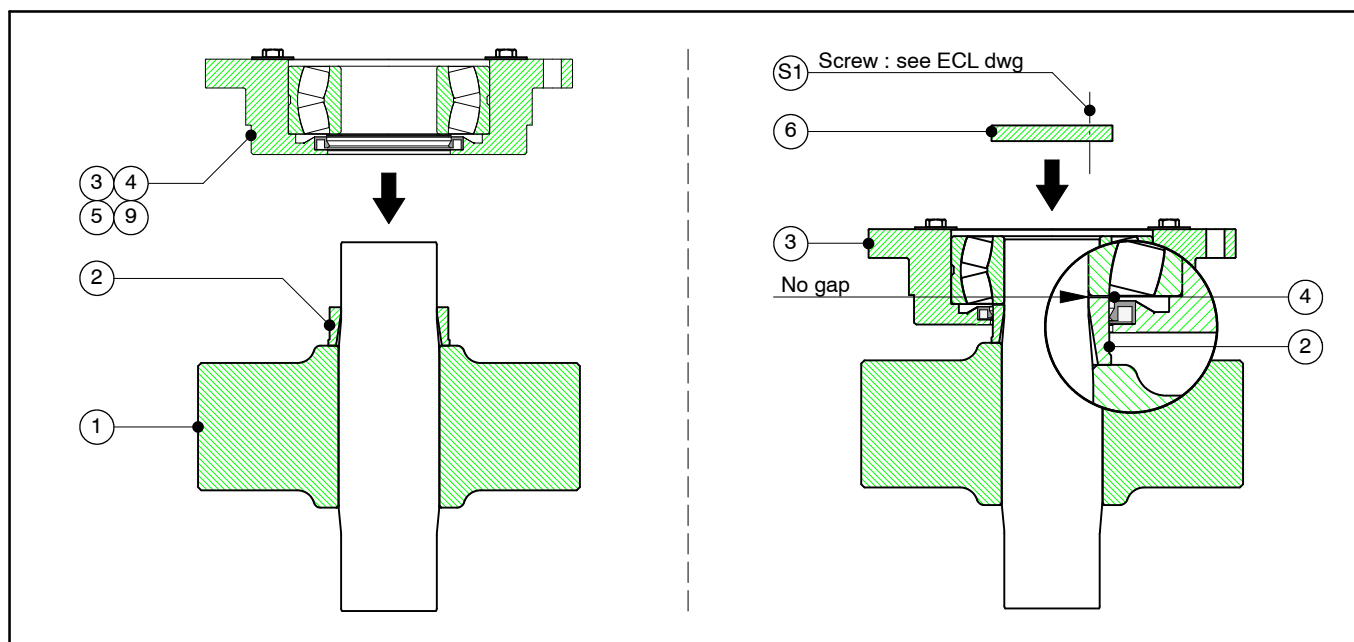


- First bearing box assembling :

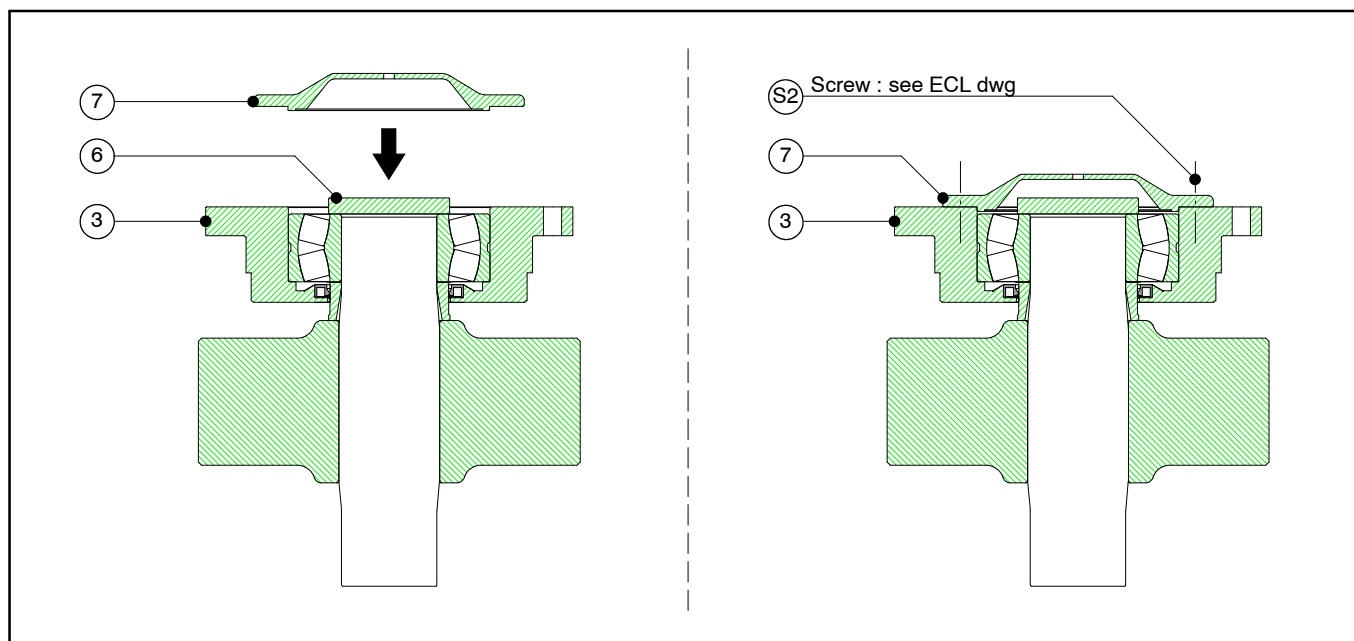
- Install the lip seal (9). **Please watch the mounting direction.**
- Install the shim (4).
- Cold assemble the spherical roller bearing (5).
- Install two provisional screws (A) and washers (B) to maintain the lip seal (9), the shim (4) and the spherical roller bearing (5) in place during the fit.
- Heat flat the bearing housing (3) associated with the lip seal (9), the shim (4) and the spherical roller bearing (5), at 110°C.



- Hot fit the bearing housing (3 + 4 + 5 + 9) on the wheel (1), ensuring the contact between the shim (4) and the spacer (2) (no gap).
- Fix immediately the washer (6) with three screws (S1) associated with Loctite paste n° 222.

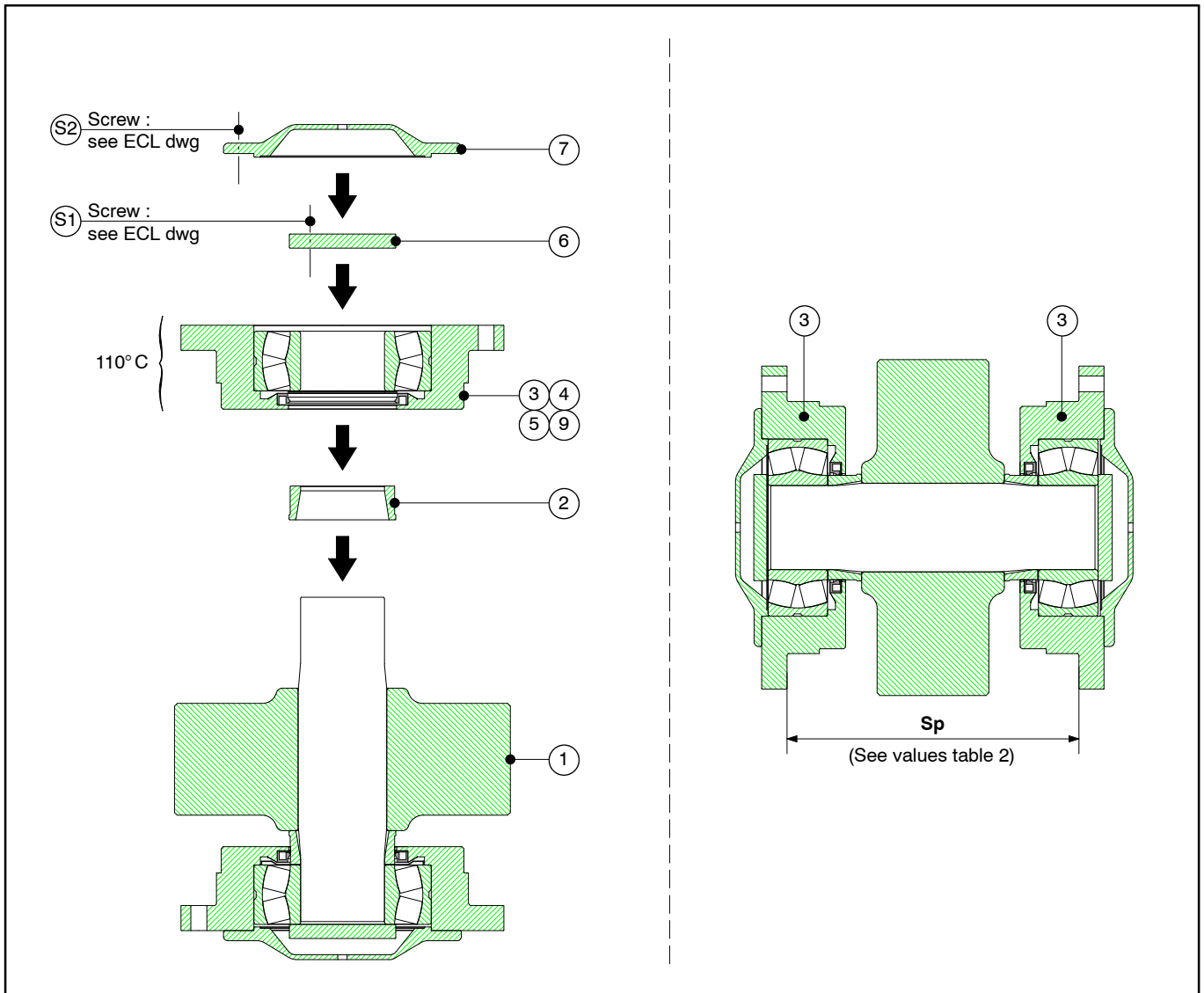


- Let bearing housing (3) cool down.
- Remove two provisional screws (A) and washers (B).
- Install the cover (7) with six screws (S2) associated with Loctite paste n° 222.



- Second bearing box assembling :

- Proceed in the same way for the second bearing housing assembling.
- Control the spacing (**Sp**) between two bearing boxes (**3**).



- Values table 2

Wheel ref.	Sp	Idle wheel weight	Grease quantity by idle wheel During assembling	Grease quantity by idle wheel During make up
dia. 300	272 ± 0.2	130 kg	960 g (2 x 480 g)	80 g (2 x 40 g)
dia. 360	312 ± 0.3	188 kg	1380 g (2 x 690 g)	100 g (2 x 50 g)
dia. 420	336 ± 0.2	252 kg	1980 g (2 x 990 g)	140 g (2 x 70 g)
dia. 480	362 ± 0.2	340 kg	2380 g (2 x 1190 g)	160 g (2 x 80 g)
dia. 550	490 ± 0.2	562 kg	2760 g (2 x 1380 g)	200 g (2 x 100 g)
dia. 620	490 ± 0.2	692 kg	3680 g (2 x 1840 g)	260 g (2 x 130 g)
dia. 700	500 ± 0.2	989 kg	4320 g (2 x 2160 g)	300 g (2 x 150 g)
Tranfer gantry	420 ± 0.2	546 kg	2040 g (2 x 1020 g)	140 g (2 x 70 g)

4. LUBRICATION

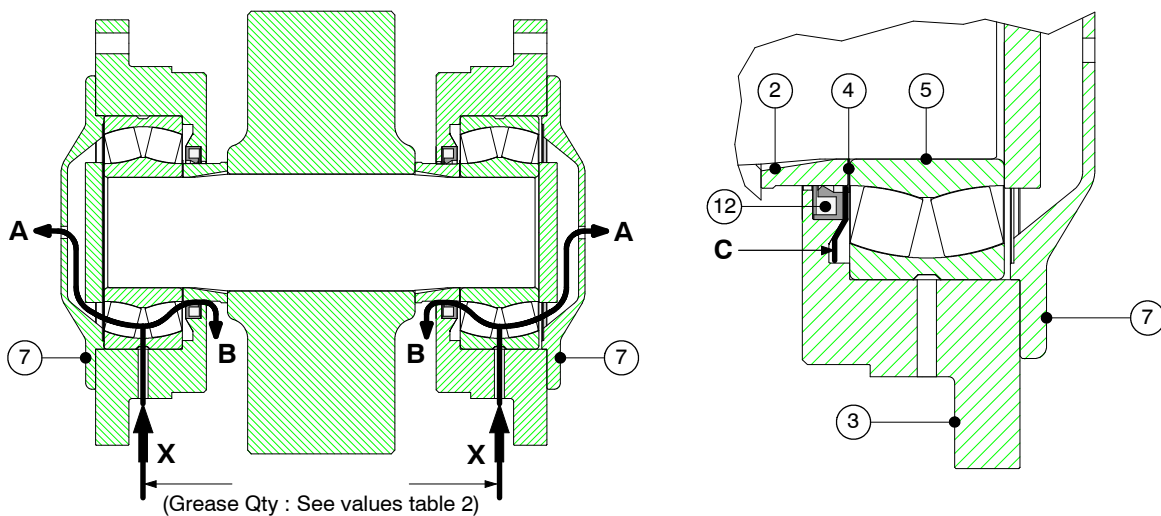


WARNING

Do not lubricate more than the prescribed quantity in the values table 2 (during assembling and make up).
During grease make up, use a volumetric measurer.

4.1. LUBRICATION DURING ASSEMBLING

- **Spacer (2) lubrication before bearing housing (3) and cover (7) assembling :**
 - Lubricate lightly and smoothly the friction surface of the lip seals (12) on the spacer (2), before assembling the bearing housing (3) on the spacer (2).
- **Bottom bearing housing (3) cavity lubrication :**
 - After the installation of the lip seals (12), lubricate the cavities (C), without excess, before the positioning of the shim (4).
- **Bearing with cover (7) lubrication :**
 - Unscrew imperatively the plug in A on the cover (7).
 - Lubricate by the point (X) until the grease comes out the point (A) or the point (B).
 - Turn the wheel with the hand during the lubrication to distribute the grease in the cavities.
 - Screw the plug in A on the cover (7).



4.2. LUBRICATION DURING GREASE MAKE UP

- **Bearing with cover (7) lubrication :**
 - Unscrew imperatively the plug in (A) on the cover (7).
 - Lubricate by the point (X) until the grease comes out the point (A) or the point (B).
 - Screw the plug in (A) on the cover (7).

4.12 GUIDING WHEEL (FOR EXAMPLE NON CONTRACTUAL VIEWS ON DRAWINGS)

ECL Document reference 1-10-581-37 rev 02 (10/2008)

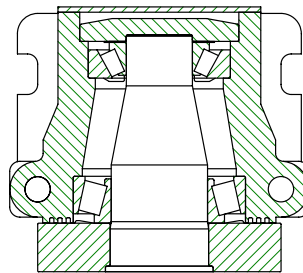
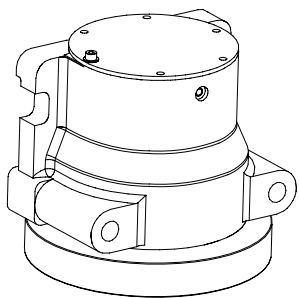


WARNING

For all maintenance operations, the operator must have thorough knowledge of this general information. The repair operations (wheel or bearings replacement) must be carried out in maintenance workshop after dismantling of the complete assembly.

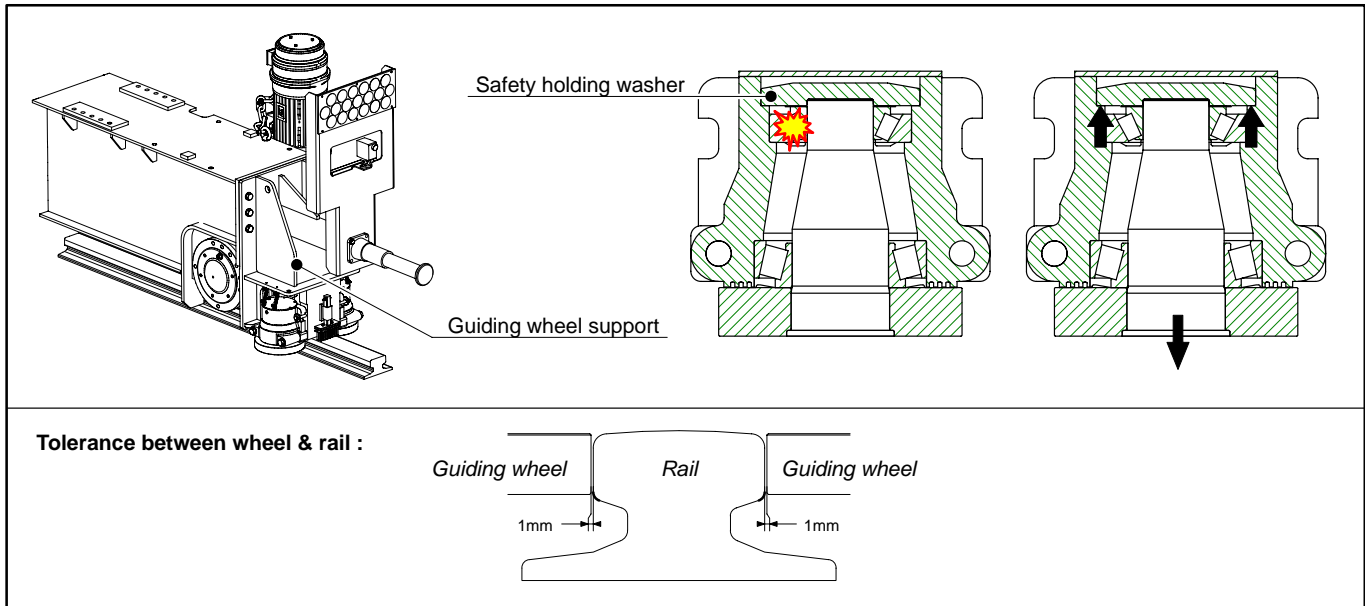
- Before all dismantling operation ensure the safety conditions and respect the safety rules in effect on site.
- Use the assembly drawings (included in spare parts manual).
- When refitting, parts have to be completely cleaned (degrease if necessary).
- Check that no alumina dust or other foreign matter get into mechanical parts.

1. GUIDING WHEEL DESCRIPTION



This guiding wheel is equipped of a safety holding washer fixed on the shaft which prevents any fall of the wheel in case of bearings breakage.

The dismantling of this guiding wheel do not require the “guiding wheel support” dismantling (supporting the hydraulic buffer, the brush and guiding wheel).



2. GUIDING WHEEL DISMOUNTING AND MOUNTING

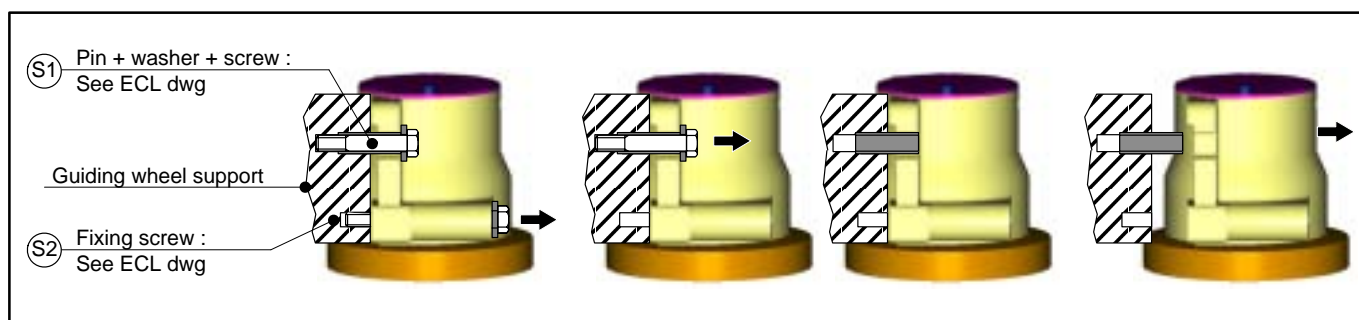
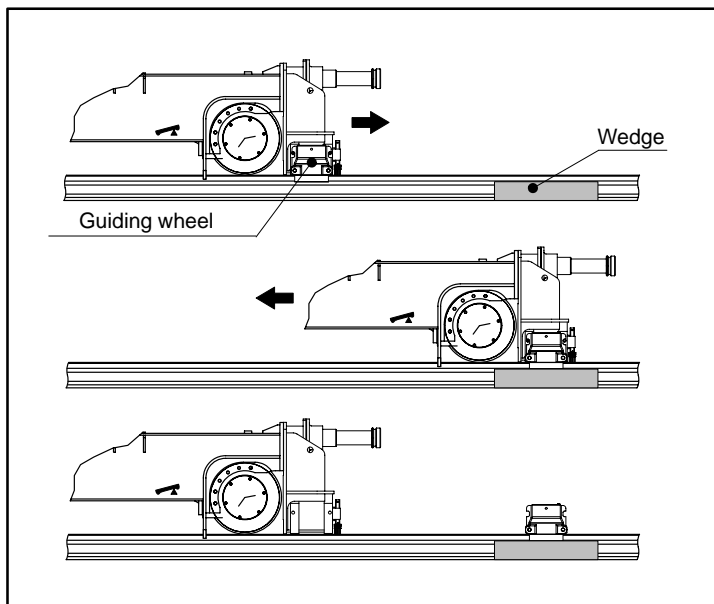


WARNING

Switch off the machine and use the appropriate tools.
Ensure the safety conditions and respect the safety rules in effect on site.

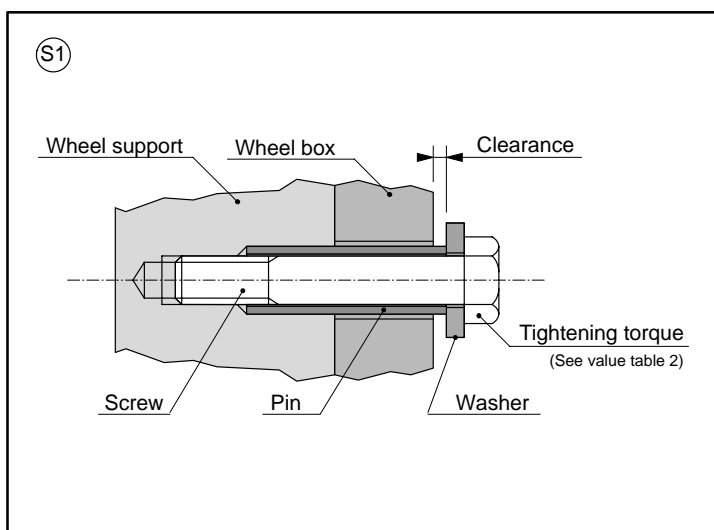
– Guiding wheel dismounting :

- Place a wedge on the beam,
- Move forward the trolley until to position the guiding wheel above the wedge,
- Remove the two fixing screws (**S2**). This screw has been fixed with Loctite paste 222 when assembling,
- Remove the two fixing screws (**S1**) passing by the washers and pins. This screw has been fixed with Loctite paste 222 when assembling,
- The guiding wheel stay in position through the pins positioned on the guiding wheel support,
- Slip the guiding wheel on the wedge then move back the trolley.



– Guiding wheel mounting.

- Proceed in reverse order and take account of the following recommendations :
- All parts of the assemblies (**S1**) and (**S2**) must be replaced and ensure that the screw grade is 10.9,
- Ensure of a clearance between the washer and wheel box on the assembly (**S1**),
- Apply the tightening torque indicated on the drawing.
- The tappings in the wheel boxes support must be carefully cleaned and degreased (removing the loctite paste), ensure that the tappings are not damaged.



3. GUIDING WHEEL HANDLING

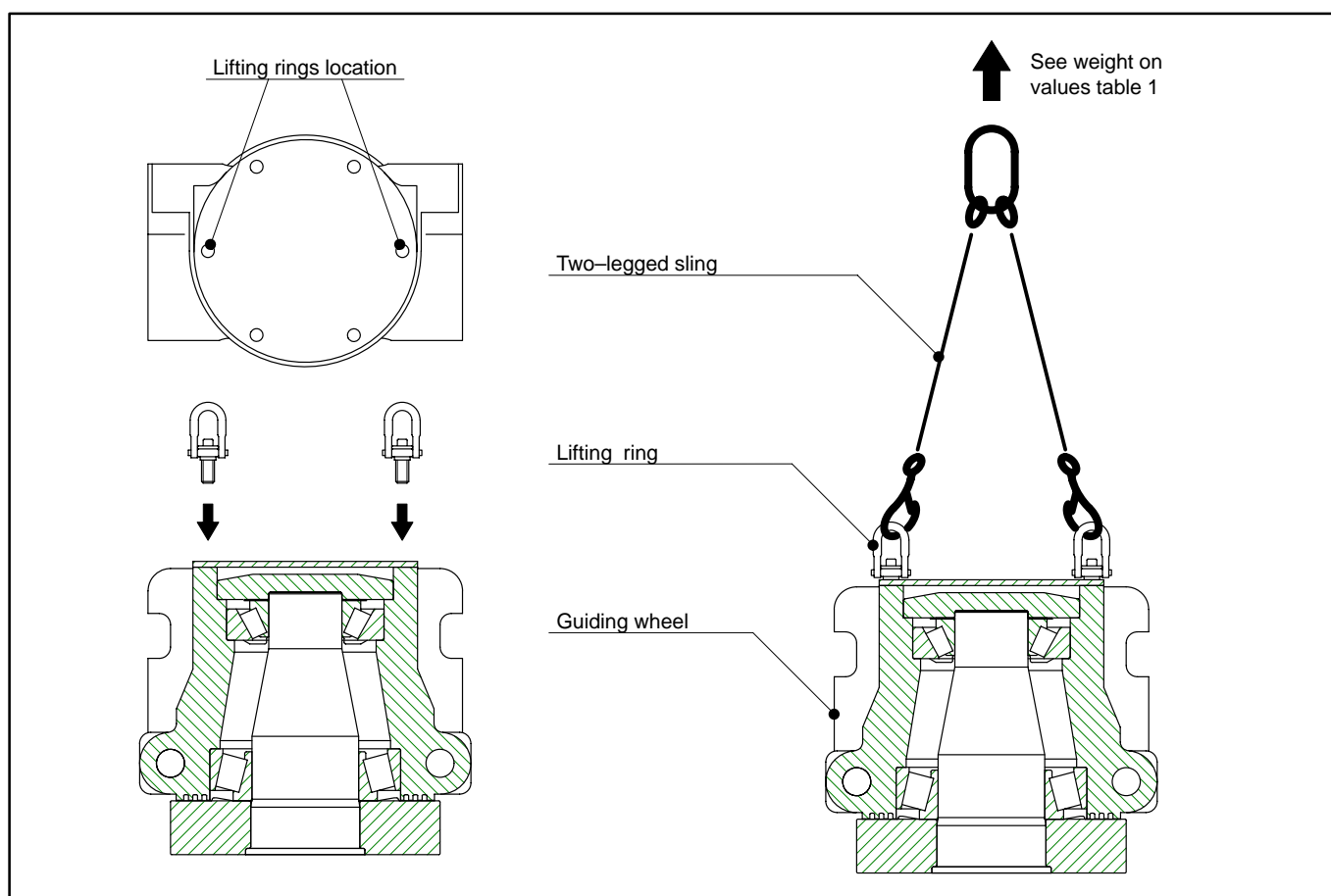


WARNING

Switch off the machine and use the appropriate lifting.
Ensure the safety conditions and respect the safety rules in effect on site.

– Guiding wheel handling :

- Remove two screws CHC M8x20–12.9 of the guiding wheel cover.
- Screw the two lifting rings (lifting capacity per ring : 200 Kg).
- Fix on rings, a two–legged sling with automatic locking hooks (lifting capacity : 400 kg)
- Raise the guiding wheel then lay down it on the ground.
- Carry out the repair operations in maintenance workshop.

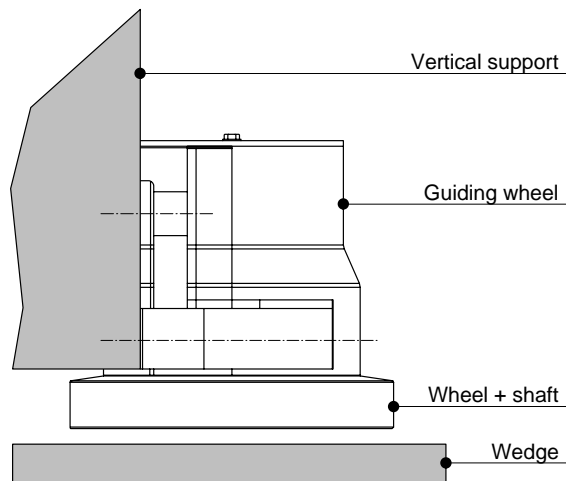


Values table 1	Wheel ref.	Dia.	Guiding wheel weight	Grease quantity by guiding wheel during assembling	Grease quantity by guiding wheel during make up
	GWH170	190	42 kg	770 g	50 g
		240	49 kg		
		290	57 kg		
	GWH225	240	78 kg	1380 g	90 g
		290	84 kg		
	GWH325	340	110 kg	2170 g	130 g
		390	120 kg		

4. GUIDING WHEEL DISMANTLING

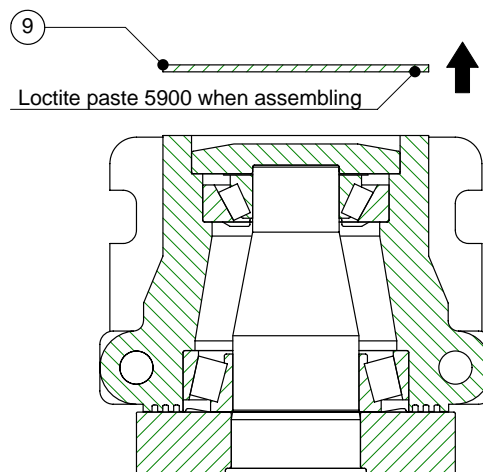
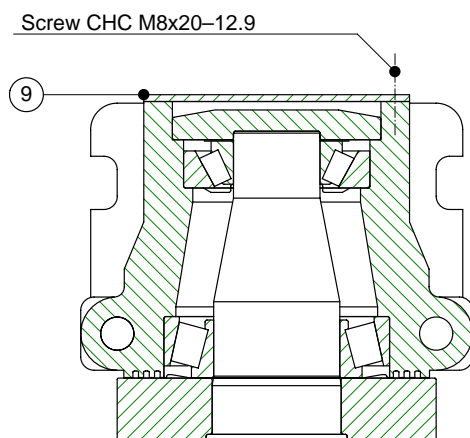
– Preliminary instructions :

- Fix the guiding wheel on a vertical support to facilitate the dismantling operations.
- Place a wedge under the guiding wheel in order to receive the wheel + shaft.



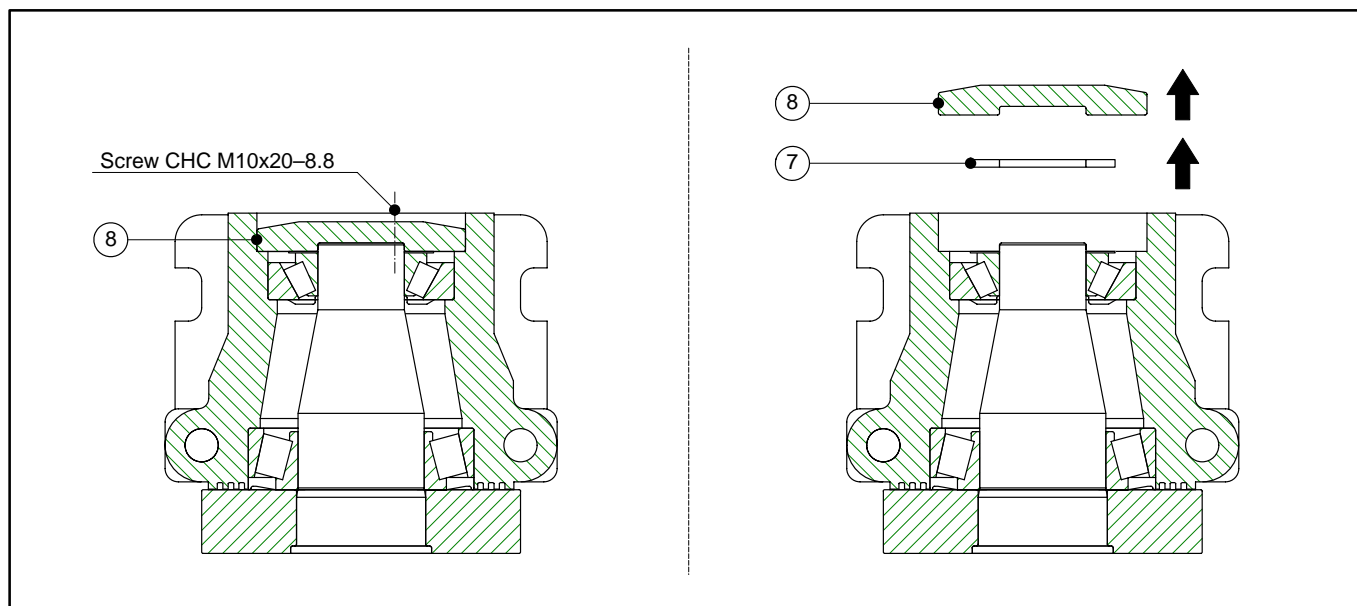
– Cover (9) dismantling :

- Remove the cover (9) by unscrewing the six CHC screws (M8x20–12.9). The cover has been mounting with Loctite paste 5900 when assembling.



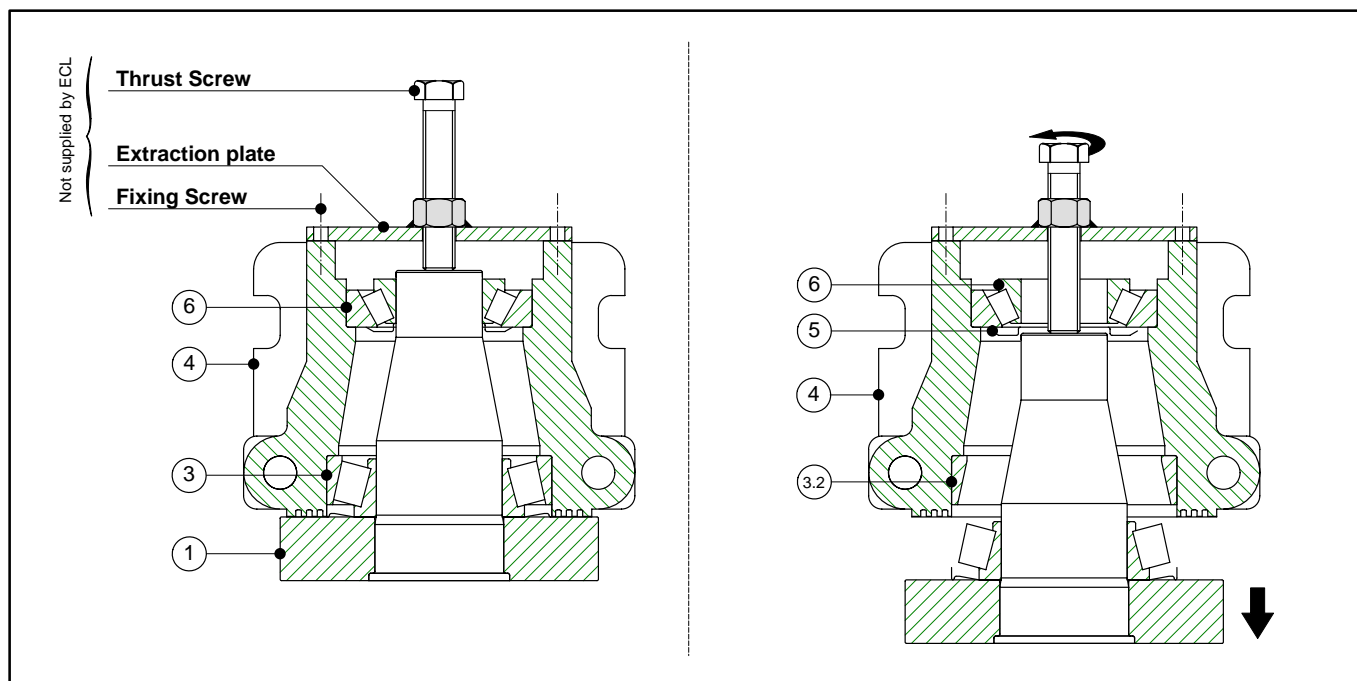
– Safety holding washer (8) dismantling :

- Remove the Safety holding washer (8) by unscrewing the three CHC screws (M10x20–8.8).
- Remove the peelable shim (7).



– Wheel (1) dismantling :

- Remove the wheel (1) from the housing + bearings (3 + 4 + 6), as described here after (see values table 2).
- Remove the bearing outer race (3.2) of the bearing (3), the ring (5) and the bearing (6), who left in the housing (4).



– Bearing inner race (3.1) and ring (2) dismantling :

- Position the wheel (1) as described hereafter (see bottom figure of next page).
- Use a hydraulic press and three “pins” (diameter 7 mm) to extract the bearing inner race (3.1) from wheel shaft (1).
- If necessary, finish the bearing inner race (3.1) extraction by using a bearing extractor. Remove the ring (2).

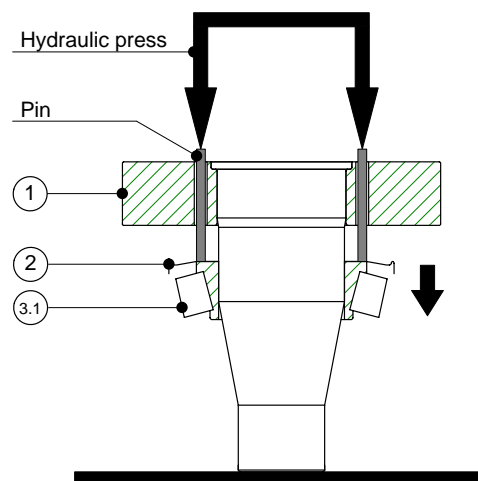
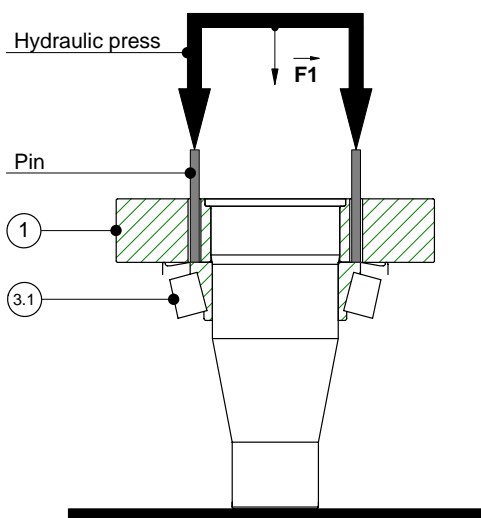
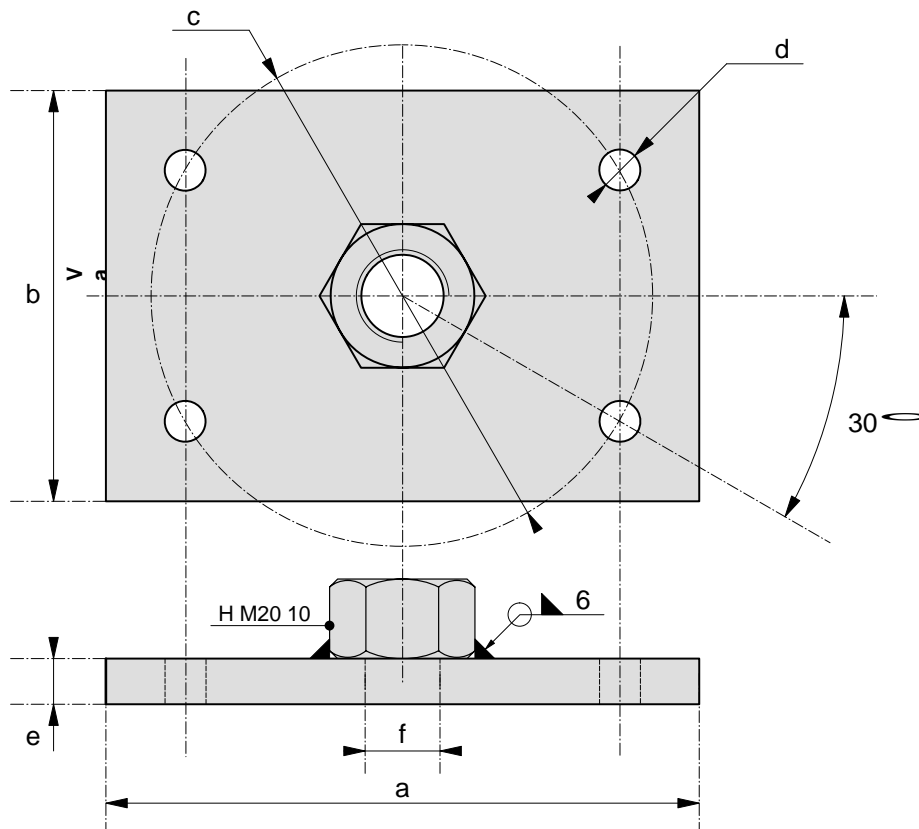
MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

Values table 2	Wheel Ref.	Dia.	Fixing screw (x4)	Thrust screw	Extraction Plate (mm) “E24–2”						Dismantling Stress F1
					a	b	c	d	e	f	
	GWH170	190	CHC M8X25–12.9	H M20x100–8.8	190	130	164	9	10	21	620 N
		240									
		290									
	GWH225	240			200	140	180				1250 N
		290									
GWH325	340	190			130	164					
	390										

Extraction Plate

(not supplied by ECL)



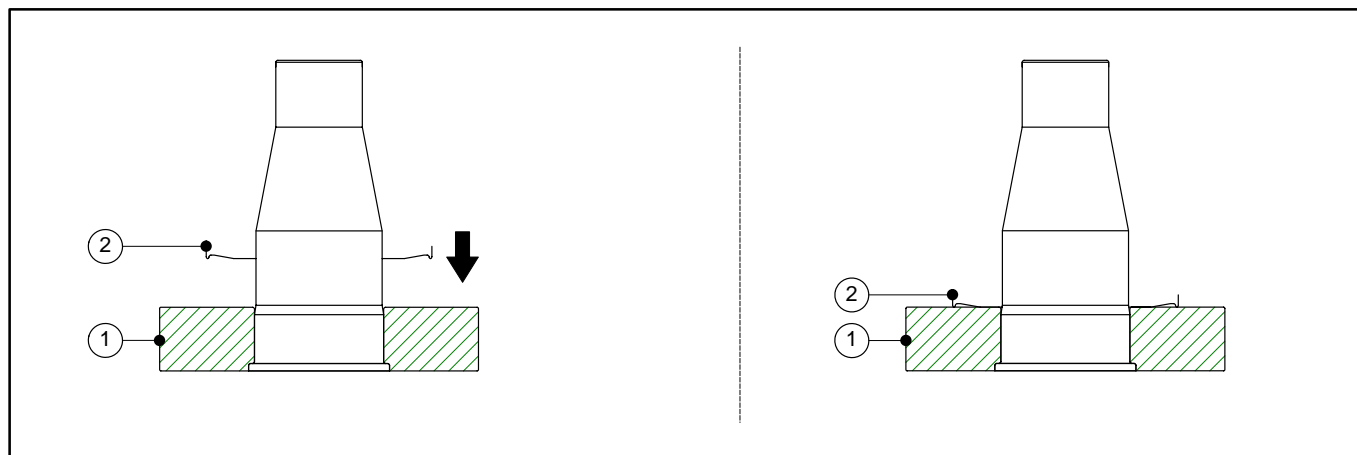
5. GUIDING WHEEL ASSEMBLING

– Preliminary instructions :

- Before assembling clean and degrease all parts and contact surfaces to be assembled.
- Install the wheel + shaft (1) on a support.

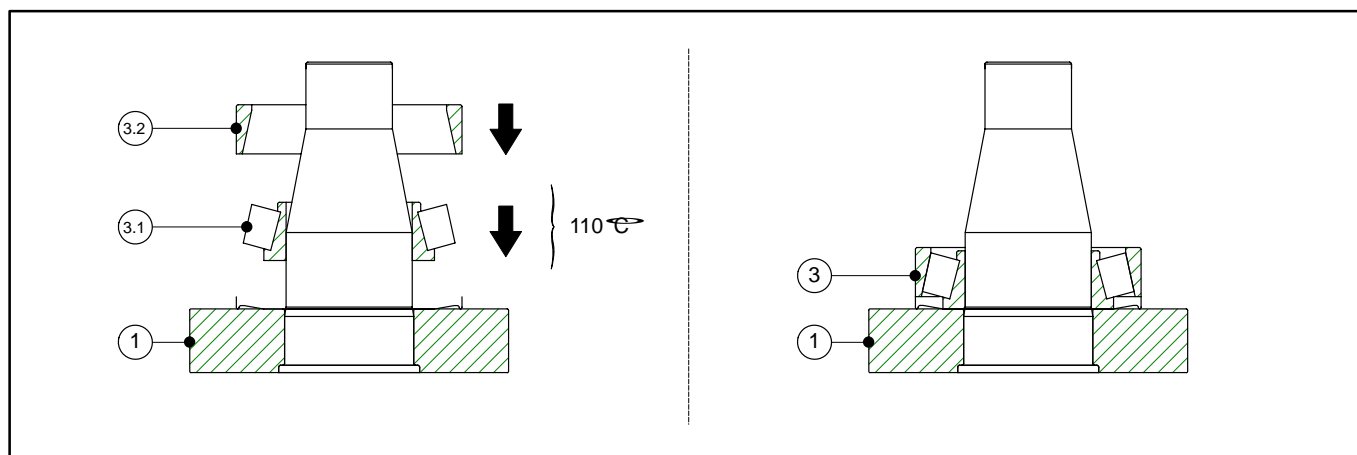
– Ring (2) assembly on the wheel + shaft (1) :

- Install the ring (2) on the wheel + shaft (1).



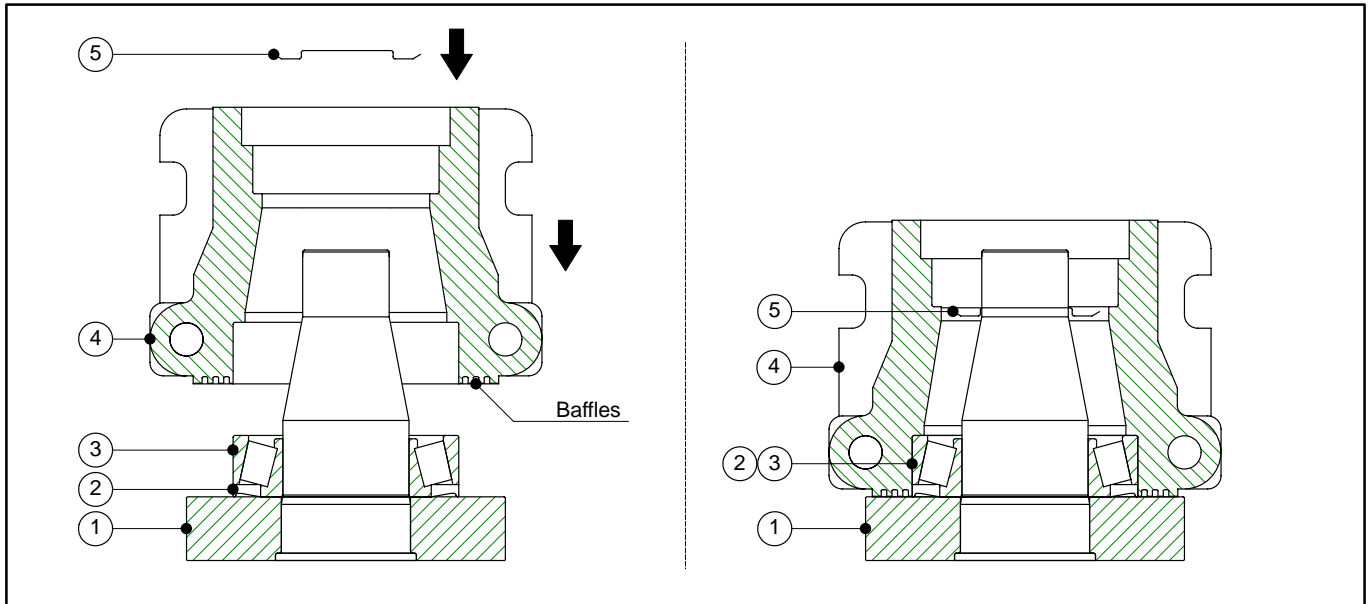
– Bearing (3) assembly :

- Heat the bearing inner race (3.1) at 110 °C.
- Hot fit the bearing inner race (3.1) of the bearing (3) on the wheel shaft (1).
- Install the bearing outer race (3.2) of the bearing (3) on bearing inner race (3.1).



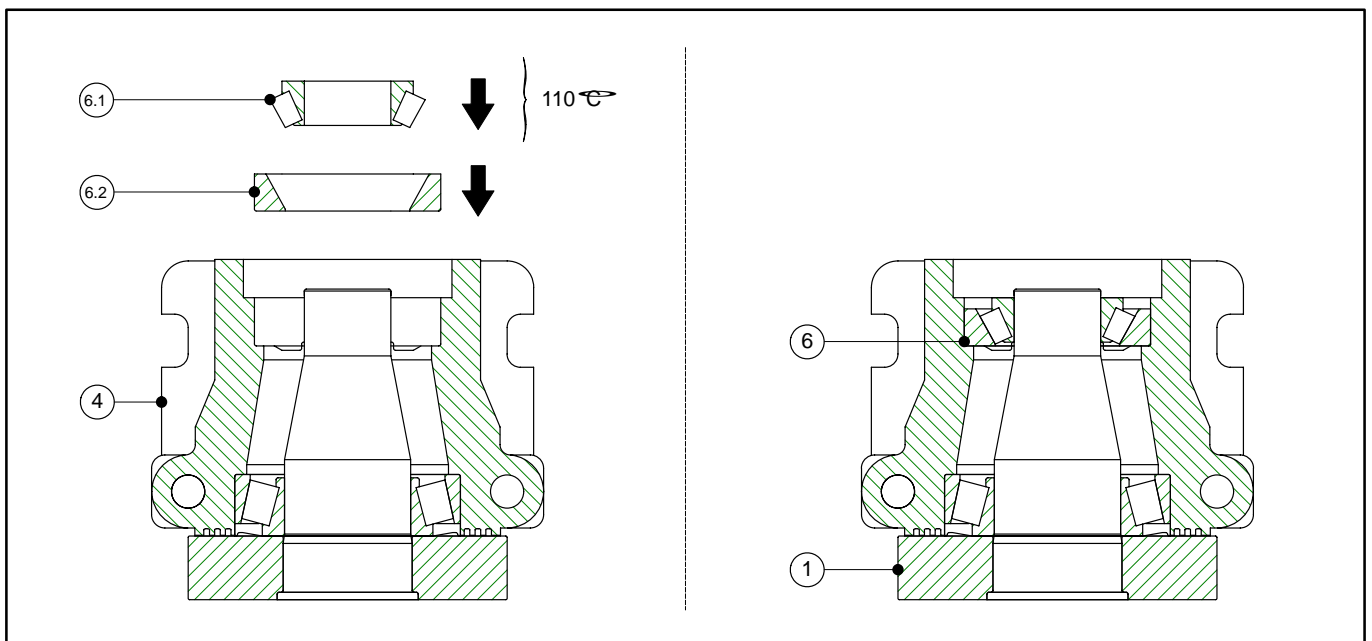
– Housing (4) assembly :

- Lubricate the housing (4) baffles.
- Cover the wheel + ring + bearing assembly (1 + 2 + 3) with the housing (4) and carry-out pre-lubrication. See “values table 1” and chapter “GREASING AND LUBRICATION”.
- Install the ring (5) on the wheel shaft (1).



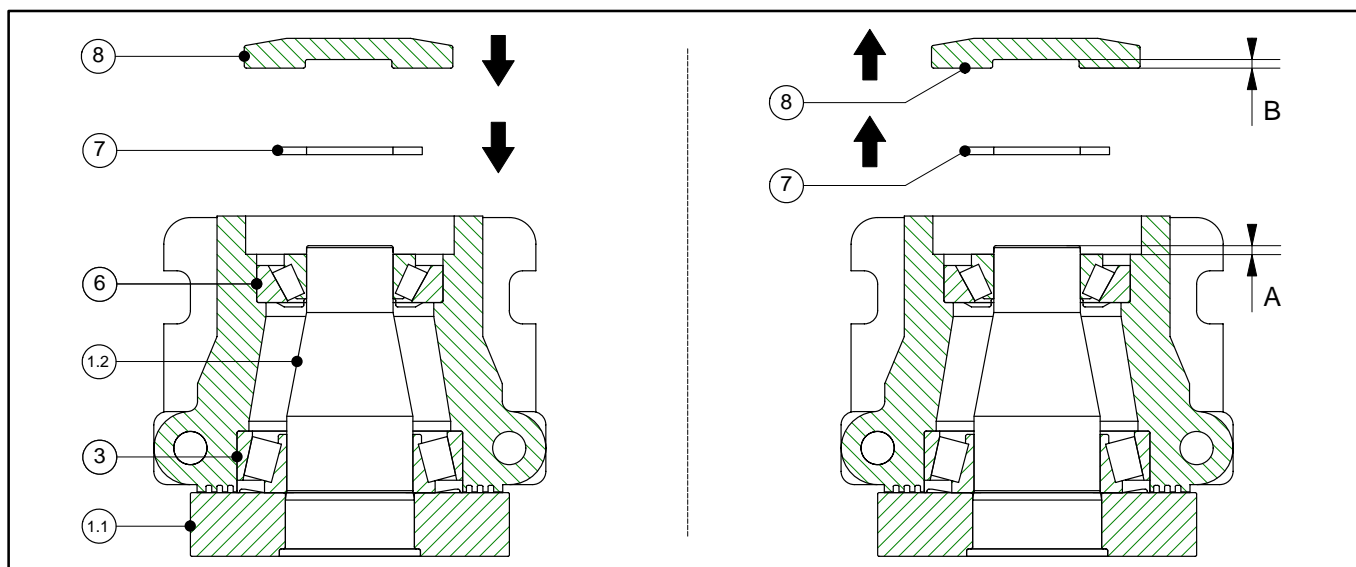
– Bearing (6) assembly :

- Install the bearing outer race (6.2) of the bearing (6) in the housing (4).
- Heat the bearing inner race (6.1) at 110 °C.
- Hot fit the bearing inner race (6.1) of the bearing (6) on the wheel shaft (1).

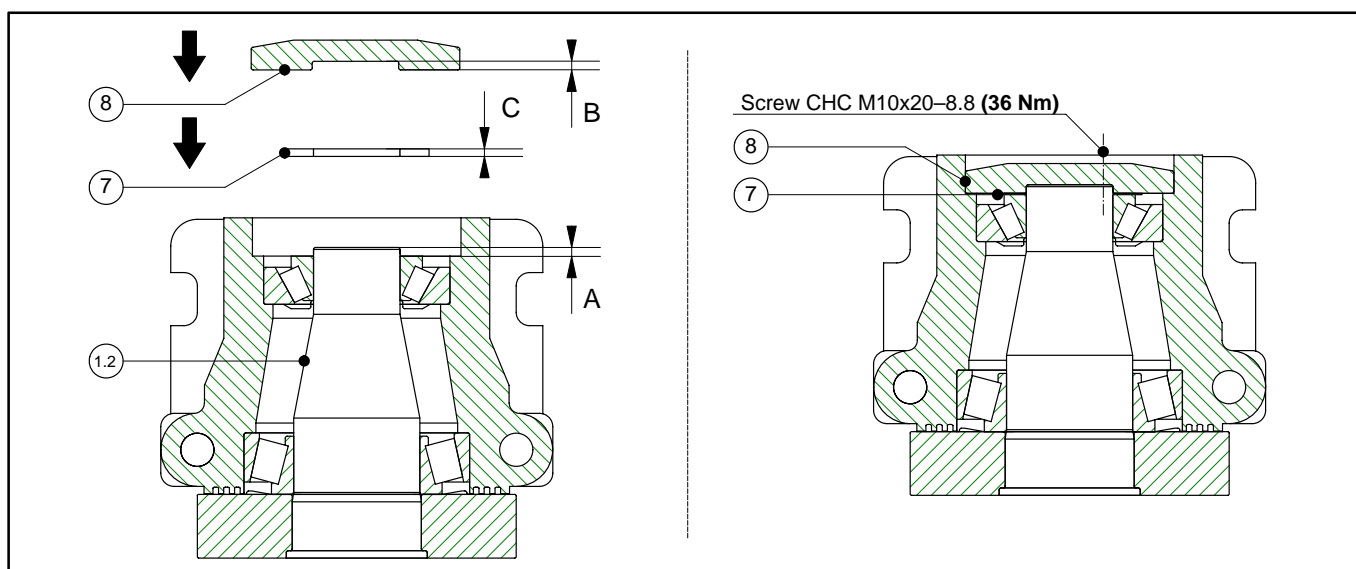


– Peelable shim (7) and safety holding washer (8) assembly :

- Fix the assembly on a vertical support to facilitate the following mounting operations.
- Position the peelable shim (7) (thickness 1.5 mm) on the shaft (1.2).
- Position the safety holding washer (8) with three CHC screws (M10x20–8.8) then tighten (36 Nm) to compress the bearings (6) and (3).
- Make turn the wheel (1.1). Remove the safety holding washer (8) and the peelable shim (7).
- Measure the dimension (A) in three 120° spaced points then measure the dimension (B).

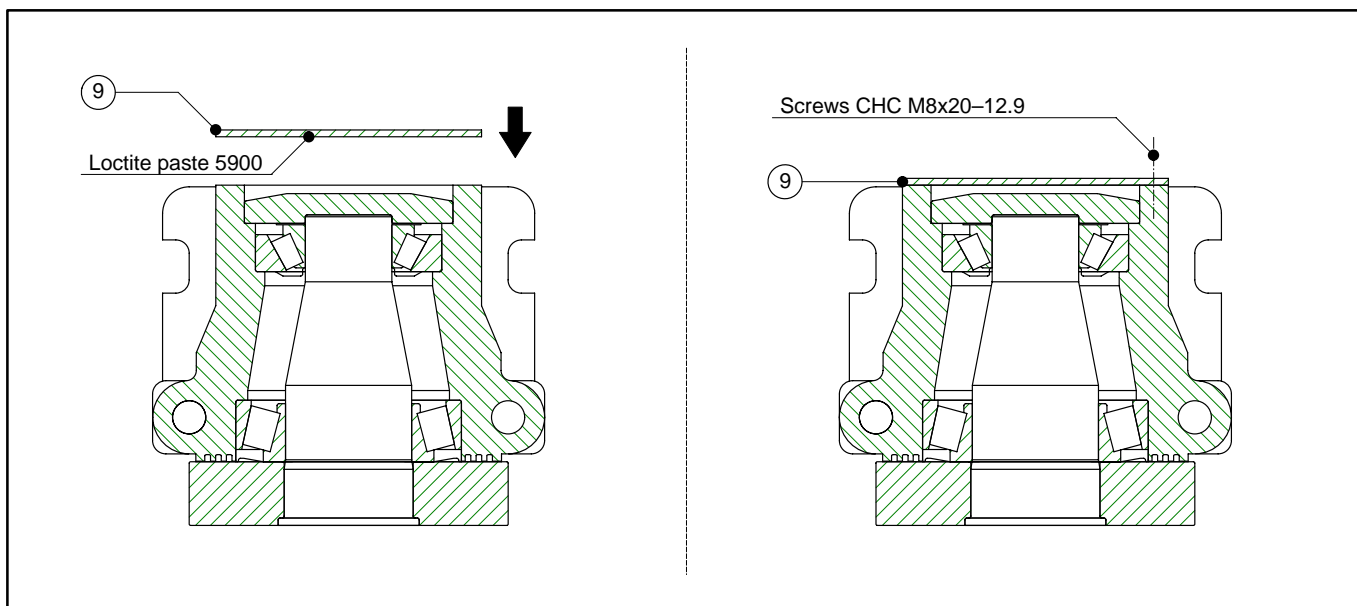


- Skin the peelable shim (7) until to obtaining a thickness (C) = (average of A) – (B)
- Checking (see clearance j3 on drawing) :
 - $j3 \min \leq C \leq j3 \max$
 - If $C < j3 \min$ begin again at the first stage
 - If $C > j3 \max$ begin again at the first stage after having given a blow of hammer on the shaft (1.2).
- Install the peelable shim (7) and the safety holding washer (8) with three CHC screws (M10x20–8.8).



– Cover (9) assembly :

- Install the cover (9) with the Loctite paste 5900 and six screws CHC (M8x20–12.9).

**– Assembly on the trolley :**

- Lubricate bearings (see “GREASING AND LUBRICATION” chapter for grease reference) by making turn the wheel, until the grease overflows between the wheel and the housing.
- Check the grease quantity in values table 1.
- Install the guiding wheel on the trolley (see paragraph “Guiding wheel dismounting and mounting”).

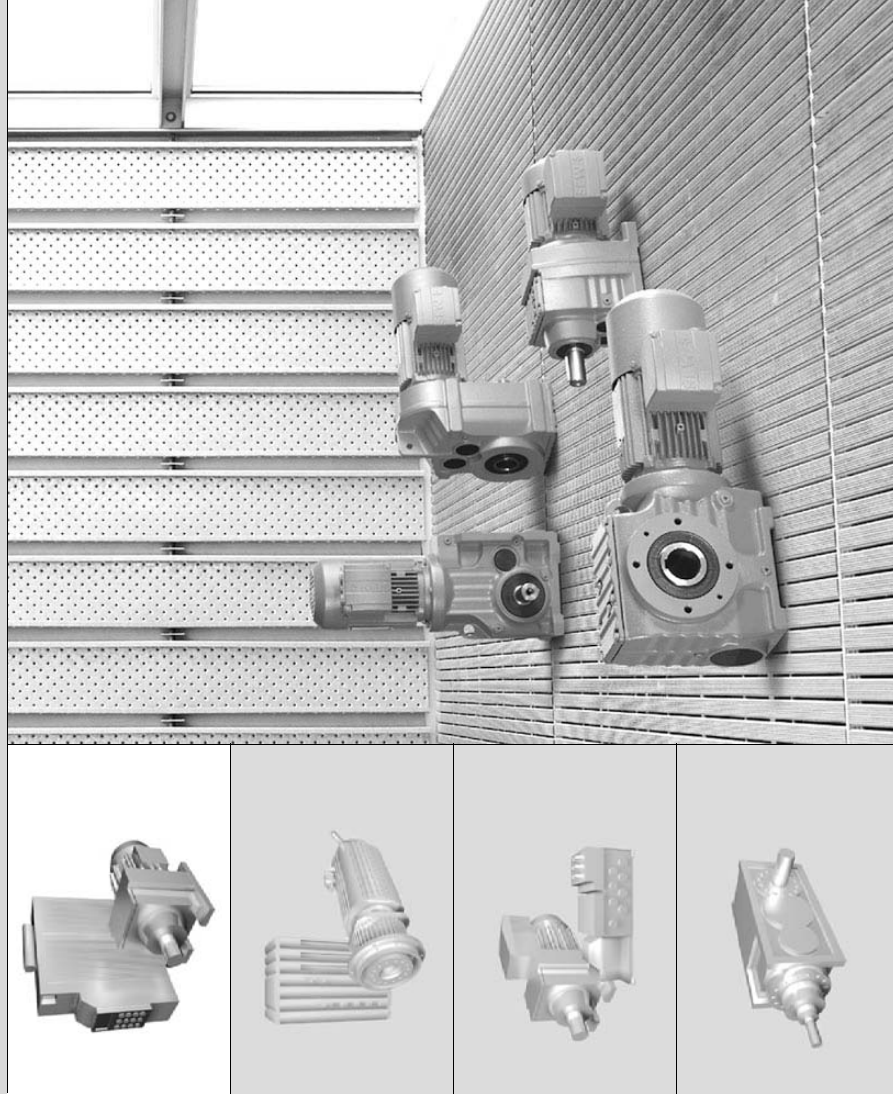
**WARNING**

**Do not lubricate more than the prescribed quantity in the values table 1
(during assembling and make up).
During grease make up, use a volumetric measurer.**

4.13 REDUCERS K..7

Location	ECL Code	Reducer reference	Position
Long travel mechanism	1-10-668-41	KH127T / A – AM180	M4 – Vertical
Long travel mechanism	1-10-668-42	KH127T / A – AM180	M4 – Vertical
Motor guided cross travel end truck	1-10-876-80	KH97 / A	M3 – Horizontal
Motor guided cross travel end truck	1-10-877-45	KH97 / B	M3 – Horizontal
Bath pipe and crust breaker	1-10-827-08	KA47 / AB	M1 – Horizontal





Gear Units, R..7, F..7, K..7, S..7 Series, SPIROPLAN® W

A6.B01

Edition 05/2004
11226811 / EN

Operating Instructions

Contents

1	Important Notes.....	4
2	Safety Notes	6
3	Gear Unit Structure.....	9
3.1	Basic structure of helical gear units	9
3.2	Basic structure of parallel shaft helical gear units.....	10
3.3	Basic structure of helical-bevel gear units	11
3.4	Basic structure of helical-worm gear units	12
3.5	Basic structure of SPIROPLAN® gear units	13
3.6	Nameplate, unit designation	14
4	Mechanical Installation.....	15
4.1	Required tools / aids	15
4.2	Prerequisites for assembly	15
4.3	Installing the gear unit	16
4.4	Gear unit with solid shaft.....	19
4.5	Torque arms for mounted gear units.....	21
4.6	Mounted gear unit with keyway or splined hollow shaft	23
4.7	Mounted gear units with shrink disc	27
4.8	Mounted gear units with TorqLOC®	30
4.9	AM adapter coupling	36
4.10	AQ adapter coupling	38
4.11	AD input shaft assembly	40
5	Startup.....	44
5.1	Startup of helical-worm and SPIROPLAN® W gear units.....	44
5.2	Startup of helical, parallel shaft helical and helical-bevel gear units	44
6	Inspection and Maintenance	45
6.1	Inspection and maintenance intervals	45
6.2	Lubricant change intervals	45
6.3	Inspection and maintenance of the gear unit	46
6.4	Inspection / maintenance of AM / AQA adapters	47
6.5	Inspection / maintenance of AD adapters	47
7	Malfunctions	48
7.1	Gear unit malfunctions	48
7.2	AM / AQA / AL adapter malfunctions	48
7.3	AD input shaft assembly malfunctions	49
8	Mounting Positions.....	50
8.1	General information on mounting positions	50
8.2	Key to the mounting position sheets	51
8.3	Mounting positions for R helical gearmotors.....	52
8.4	Mounting positions of RX helical gearmotors.....	55
8.5	Mounting positions for parallel shaft helical gearmotors	57
8.6	Mounting positions for helical-bevel gearmotors	60
8.7	Mounting positions for helical-worm gearmotors	65
8.8	Mounting positions for SPIROPLAN® W gearmotors.....	71
9	Lubricants	74
9.1	Lubricant table	74
9.2	Lubricant fill quantities	77
10	Appendix	82
10.1	Index of changes	82
11	Index.....	83



1 Important Notes

Safety and warning instructions

Always follow the safety and warning instructions in this publication!

	Electrical hazard Possible consequences: Severe or fatal injuries.
	Hazard Possible consequences: Severe or fatal injuries.
	Hazardous situation Possible consequences: Slight or minor injuries.
	Harmful situation Possible consequences: Damage to the drive and the environment.
	Tips and useful information.

You must adhere to the operating instructions to ensure:

- Trouble-free operation
- Fulfilment of any rights to claim under guarantee

Consequently, read the operating instructions before you start working with the gear unit!

The operating instructions contain important information about servicing. Therefore, keep the operating instructions close to the gear unit.



- Adjust the lubricant fill volume and position of the breather valve accordingly in the event of a change of mounting position (see Sec. "Lubricants" and "Mounting Positions").
- Follow the instructions in Sec. "Mechanical installation" / "Installing the gear unit"!



Waste disposal



Please follow the latest instructions: Dispose of the following materials in accordance with the regulations in force:

- Steel scrap:
 - Housing parts
 - Gears
 - Shafts
 - Anti-friction bearing
 - Gray-cast iron (if there is no special collection)
- Parts of the worm gears are made of non-ferrous metals. Dispose of the worm gears as appropriate.
- Collect waste oil and dispose of it correctly.



2 Safety Notes

Preface

The following safety notes are primarily concerned with the use of gear units. If using **gearmotors**, please also refer to the safety notes for motors in the relevant operating instructions.

Please also consider the supplementary safety notes in the individual sections of these operating instructions.

General information

During and after operation, gearmotors, gear units and motors have:

- Live parts
- Moving parts
- Hot surfaces (may be the case)

Only qualified personnel may carry out the following work:

- Transportation
- Putting into storage
- Installation / assembly
- Connection
- Startup
- Maintenance
- Servicing

The following information and documents must be observed during these processes:

- Relevant operating instructions and wiring diagrams
- Warning and safety signs on the gear unit / gearmotor
- System-specific regulations and requirements
- National / regional regulations governing safety and the prevention of accidents

Serious injuries and property damage may result from:

- Improper use
- Incorrect installation or operation
- Unauthorized removal of necessary protection covers or the housing

Designated use

Gearmotors / gear units from SEW are intended for industrial systems. They correspond to the applicable standards and regulations.

Technical data and information about the permitted conditions can be found on the nameplate and in the documentation.

It is essential that you follow all the instructions!



Transportation

Inspect the shipment for any damage that may have occurred in transit as soon as you receive the delivery. Inform the shipping company immediately. It may be that you are not permitted to startup the drive due to the damage.

Tighten installed eyebolts. The eyebolts are only designed for the weight of the gearmotor / gear unit. Do not attach any additional loads.

The installed lifting eyebolts comply with DIN 580. The loads and regulations specified in this standard must always be observed. If two eyebolts are available, use both of them for transport. In this case, the tension force vector of the slings must not exceed a 45° angle in accordance with DIN 580.

Use suitable, sufficiently rated handling equipment if necessary. Remove any transportation fixtures prior to startup.

Extended storage of gear units

Gear units of the "extended storage" type have:

- An oil fill suitable for the mounting position so the unit is ready to run (mineral oil CLP and synthetic oil CLP HC). You should still check the oil level before startup (see Sec. "Inspection / Maintenance" / "Inspection and maintenance of the gear unit").
- A higher oil level in some cases (synthetic oil CLP PG / food grade oil). Correct the oil level before startup (see Sec. "Inspection / Maintenance" / "Inspection and maintenance of the gear unit").

Comply with the storage conditions specified in the following table for extended storage:

Climate zone	Packaging ¹⁾	Storage location	Storage time
Temperate (Europe, USA, Canada, China and Russia, excluding tropical zones)	Packed in containers, with desiccant and moisture indicator sealed in the plastic wrap.	With roof, protected against rain and snow, no shock loads.	Up to three years with regular checks on the packaging and moisture indicator (relative atmospheric humidity < 50 %).
	Open	With roof, enclosed at constant temperature and relative atmospheric humidity (5 °C < ϑ < 60 °C, < 50 % relative atmospheric humidity). No sudden temperature fluctuations and controlled ventilation with filter (free from dirt and dust). No aggressive vapors and no shock loads.	Two years or more given regular inspections. Check for cleanliness and mechanical damage as part of the inspection. Check corrosion protection.
Tropical (Asia, Africa, Central America and South America, Australia, New Zealand excluding temperate zones)	Packed in containers, with desiccant and moisture indicator sealed in the plastic wrap.	With roof, protected against rain, no shock loads.	Up to three years with regular checks on the packaging and moisture indicator (relative atmospheric humidity < 50 %).
	Open	With roof, enclosed at constant temperature and atmospheric humidity (5 °C < ϑ < 60 °C, < 50 % relative atmospheric humidity). No sudden temperature fluctuations and controlled ventilation with filter (free from dirt and dust). No aggressive vapors and no shock loads. Protection against insect damage.	Two years or more given regular inspections. Check for cleanliness and mechanical damage as part of the inspection. Check corrosion protection.

1) Packaging must be performed by an experienced company using the packaging materials that have been expressly specified for the particular application.



Safety Notes

- Installation / assembly**
Observe the instructions in the sections "Installation" and "Assembly/Removal"!
- Startup / operation**
Check that the direction of rotation is correct in **decoupled** status. Listen out for unusual grinding noises as the shaft rotates.
Secure the shaft keys for test mode without drive components. Do not render monitoring and protection equipment inoperative even for test mode.
Switch off the gearmotor if in doubt whenever changes occur in relation to normal operation (e.g. increased temperature, noise, vibration). Determine the cause; contact SEW-EURODRIVE if necessary.
- Inspection / maintenance**
Follow the instructions in the section "Inspection and Maintenance"!



Gear Unit Structure
Basic structure of helical gear units

3 Gear Unit Structure



The following figures are block diagrams. Their purpose is only to make it easier to assign components to the spare parts lists. Discrepancies may occur depending on the gear unit size and version!

3.1 Basic structure of helical gear units

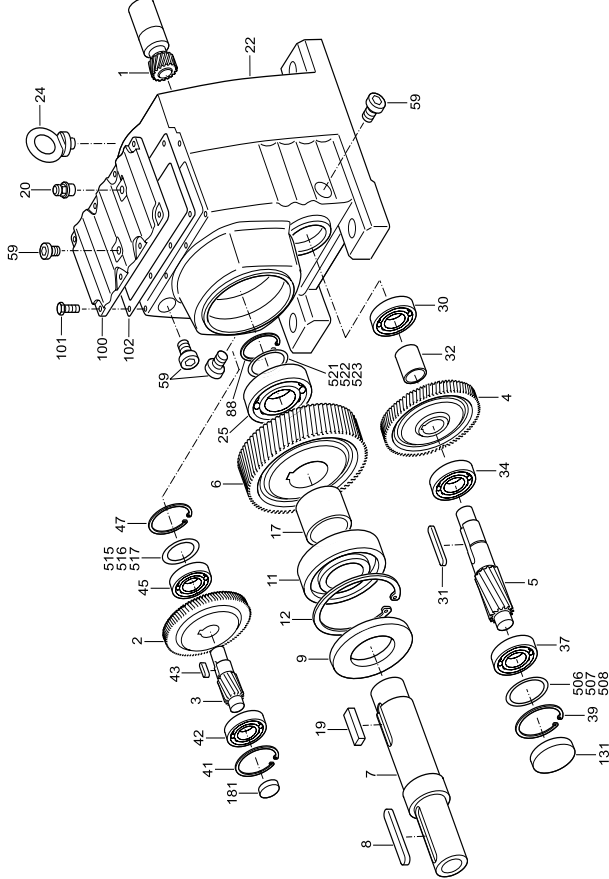


Figure 1: Basic structure of helical gear units

Key

1	Pinion	19	Key	42	Anti-friction bearing	507	Shim ring
2	Gear	20	Breather valve	43	Key	508	Shim ring
3	Pinion shaft	22	Gearcase	45	Anti-friction bearing	515	Shim ring
4	Gear	24	Lifting eyebolt	47	Circclip	516	Shim ring
5	Pinion shaft	25	Anti-friction bearing	59	Screw plug	517	Shim ring
6	Gear	30	Anti-friction bearing	88	Circclip	521	Shim ring
7	Output shaft	31	Key	100	Gearcase cover	522	Shim ring
8	Key	32	Spacer	101	Hex head bolt	523	Shim ring
9	Oil seal	34	Anti-friction bearing	102	Gasket		
11	Anti-friction bearing	37	Anti-friction bearing	131	Closing cap		
12	Circclip	39	Circclip	181	Closing cap		
17	Spacer	41	Circclip	506	Shim ring		

03438AXX



3.2 Basic structure of parallel shaft helical gear units

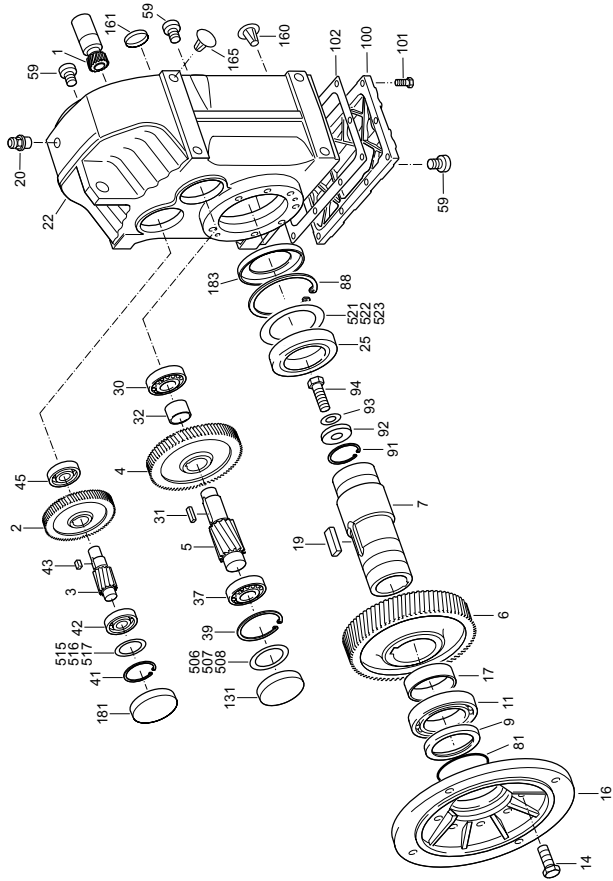


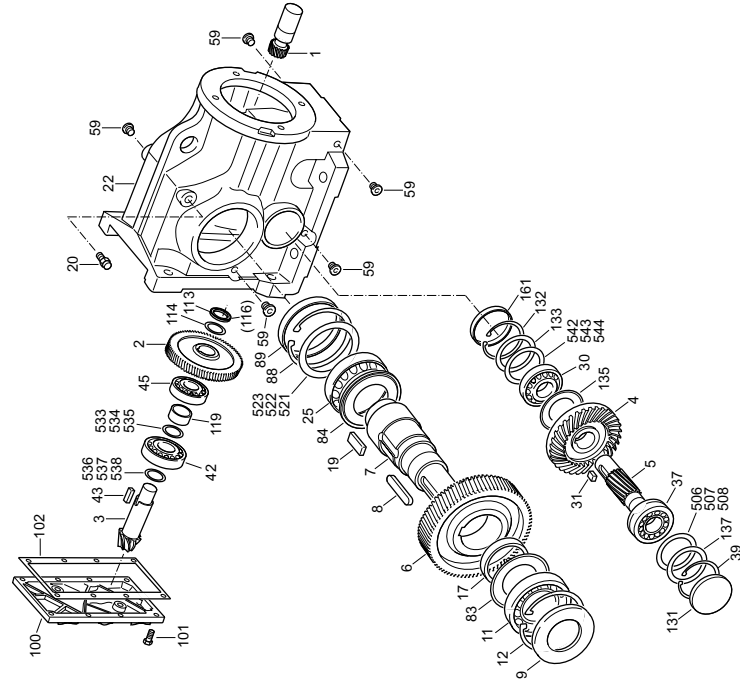
Figure 2: Basic structure of parallel shaft helical gear units

1	Pinion	22	Gearcase	91	Circclip	506	Shim ring
2	Gear	25	Anti-friction bearing	92	Washer	507	Shim ring
3	Pinion shaft	30	Anti-friction bearing	93	Lock washer	508	Shim ring
4	Gear	31	Key	94	Hex head bolt	515	Shim ring
5	Pinion shaft	32	Spacer	100	Gearcase cover	516	Shim ring
6	Gear	37	Anti-friction bearing	101	Hex head bolt	517	Shim ring
7	Hollow shaft	39	Circclip	102	Gasket	521	Shim ring
9	Oil seal	41	Circclip	131	Closing cap	522	Shim ring
11	Anti-friction bearing	42	Anti-friction bearing	160	Closing plug	523	Shim ring
14	Hex head bolt	43	Key	161	Closing cap		
16	Output flange	45	Anti-friction bearing	165	Closing plug		
17	Spacer	59	Screw plug	181	Closing cap		
19	Key	81	O-ring	183	Oil seal		
20	Breather valve	88	Circclip				

05676AXX



3.3 Basic structure of helical-bevel gear units





3.4 Basic structure of helical-worm gear units

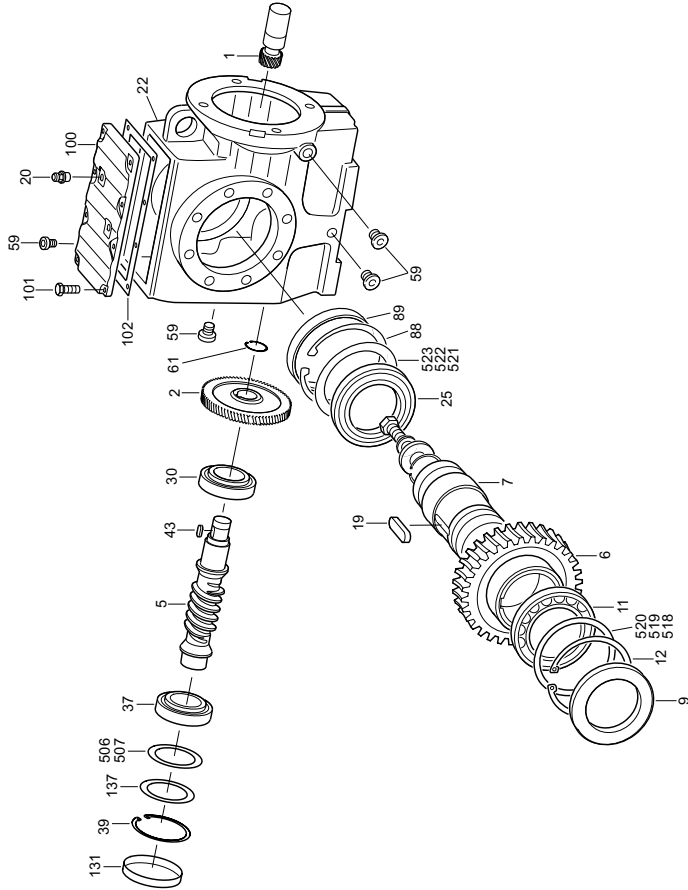


Figure 4: Basic structure of helical-worm gear units

50884AXX

Key

1	Pinion	20	Breather valve	88	Circlip	518	Shim ring
2	Gear	22	Gearcase	89	Closing cap	519	Shim ring
5	Worm	25	Anti-friction bearing	100	Gearcase cover	520	Shim ring
6	Worm gear wheel	30	Anti-friction bearing	101	Hex head bolt	521	Shim ring
7	Output shaft	37	Anti-friction bearing	102	Rubber seal	522	Shim ring
9	Oil seal	39	Circlip	131	Closing cap	523	Shim ring
11	Anti-friction bearing	43	Key	137	Spacer		
12	Circlip	59	Screw plug	506	Shim ring		
19	Key	61	Circlip	507	Shim ring		



3.5 Basic structure of SPIROPLAN® gear units

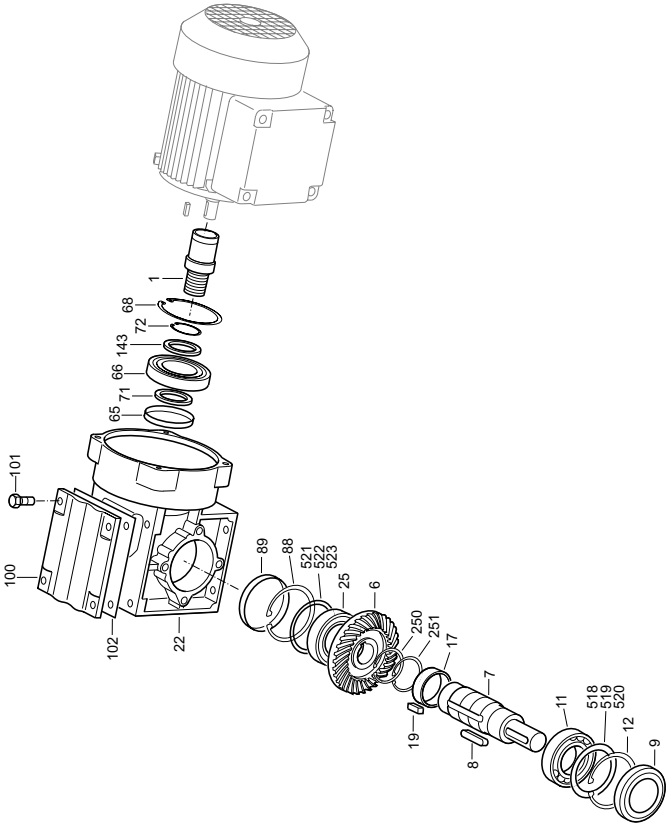


Figure 5: Basic structure of SPIROPLAN® gear units

05674AXX

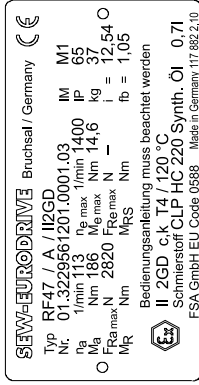
Key

1	Pinion	19	Key	88	Circlip	251	Circlip
6	Gear	22	Gearcase	89	Closing cap	518	Shim ring
7	Output shaft	25	Anti-friction bearing	100	Gearcase cover	519	Shim ring
8	Key	65	Oil seal	101	Hex head bolt	520	Shim ring
9	Oil seal	66	Anti-friction bearing	102	Gasket	521	Shim ring
11	Anti-friction bearing	71	Spacer	132	Circlip	522	Shim ring
12	Circlip	72	Circlip	183	Oil seal	523	Shim ring
17	Spacer	143	Spacer	250	Circlip		



3.6 Nameplate, unit designation

Sample nameplate



0687ADE

Figure 6: Sample nameplate

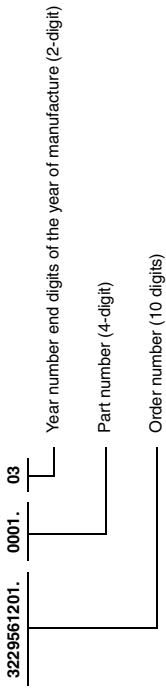
- f_b = Service factor
- $F_{Ra\ max}$ [N] = Maximum overhung load on the output side
- $F_{Re\ max}$ [N] = Maximum overhung load on the input side (with input shaft assembly AD)
- i = Gear unit reduction ratio
- IM = Mounting position
- IP.. = Enclosure
- $n_g\ max$ [1/min] = Maximum input speed
- n_a [1/min] = Output speed
- $M_{a\ max}$ [Nm] = Maximum input torque
- M_a [Nm] = Output torque
- M_R [Nm] = Overload torque when using an AR adapter
- M_{RS} [Nm] = Locking torque of the backstop

Unit designation

Example: Helical gear unit, category I/2GD



Example: Serial number





Mechanical Installation

Installing the gear unit

- You must clean the output shafts and flange surfaces thoroughly to ensure they are free of anti-corrosion agents, contamination or similar. Use a commercially available solvent. Do not let the solvent come into contact with the sealing lips of the oil seals – danger of damage to the material!
- When the drive is installed in abrasive ambient conditions, protect the output end oil seals against wear.

4.3 Installing the gear unit

The gear unit or gearmotor is only allowed to be installed in the specified mounting position. SPIROPLAN® gear units are not dependent on the mounting position.

The support structure must have the following characteristics:

- Level
- Vibration damping
- Torsionally rigid

Maximum permitted flatness error for foot and flange mounting (approximate values with reference to DIN ISO 1101):

- Gear unit size ≤ 67: max. 0.4 mm
- Gear unit size 77 ... 107: max. 0.5 mm
- Gear unit size 137 ... 147: max. 0.7 mm
- Gear unit size 157 ... 187: max. 0.8 mm

Do not tighten the housing legs and mounting flanges against one another and ensure that you comply with the permitted overhung and axial loads!

Secure the gearmotors with bolts of quality 8.8.

Secure the following gearmotors with bolts of quality 10.9:

- RF37, R37F with flange Ø 120 mm
- RF47, R47F with flange Ø 140 mm
- RF57, R57F with flange Ø 160 mm



The oil checking and drain screws and the breather valves must be freely accessible!

At the same time, also check that the oil fill is as specified for the mounting position (see Sec. "Lubricants" / "Lubricant fill quantities" or refer to the information on the nameplate). The gear units are filled with the required oil volume at the factory. There may be slight deviations at the oil level plug as a result of the mounting position, which are permitted within the manufacturing tolerances.



Mechanical Installation

Installing the gear unit

Adjust the lubricant fill volumes and the position of the breather valve accordingly in the event of a change of mounting position.

Please contact our SEW customer service if you change the mounting position of K gear units to M5 or M6 or between M5 and M6.

Please contact our SEW customer service if you change the mounting position of size S47 S97 S gear units to mounting position M2.

Use plastic inserts (2 ... 3 mm thick) if there is a risk of electrochemical corrosion between the gear unit and the driven machine. The material used must have an electrical bleeder resistor < 10⁹ Ω. Electrochemical corrosion can occur between various metals, for example, cast iron and high-grade steel. Also install the bolts with plastic washers! Ground the housing additionally – use the grounding bolts on the motor.

Drives are supplied in corrosion-resistant versions for use in damp areas or in the open air. Repair any damage to the paint work (e.g. on the breather valve).

When mounting the motors onto AM, AQ, AR, AT adapters, seal the flange areas with a suitable sealing compound, e.g. Loctite® 574.

Installation in damp locations or in the open



Mechanical Installation

Installing the gear unit

Gear unit venting

No breather plug is required for the following gear units:

- R07 in mounting positions M1, M2, M3, M5 and M6
- R17, R27 and F27 in mounting positions M1, M3, M5 and M6
- SPIROPLAN® W gear units

SEW-EURODRIVE supplies all other gear units with the breather valve installed and activated according to the particular mounting position.

Exceptions:

1. SEW supplies the following gear units with a screw plug on the vent hole provided:
 - Gear units for extended storage
 - Pivoted mounting positions, if possible
 - Gear units for mounting on a slant

The breather valve is located in the motor terminal box. Before startup, you must replace the highest screw plug with the breather valve supplied.
2. SEW supplies a breather valve in a plastic bag for **gear head units** requiring venting on the input end.
3. **Enclosed gear units** are supplied without a breather valve.

Activating the breather valve

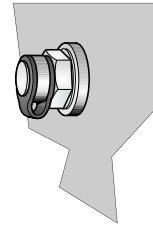
As a rule, the breather valve is already activated at the factory. If the breather valve has not been activated, you must remove the transport fixture from the breather valve before starting up the gear unit!

1. Breather valve with transport fixture

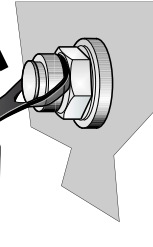


2. Remove the transport fixture

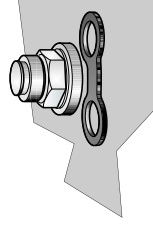
3. Breather valve activated



02053BXX



02054BXX



02055BXX

Painting the gear unit

If you paint or respray the drive, ensure that you cover the breather valve and oil seals carefully. Remove the strips of tape after completing the painting work.

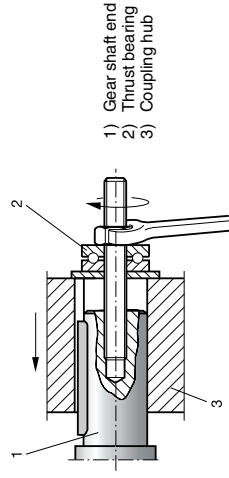


Mechanical Installation

Gear unit with solid shaft

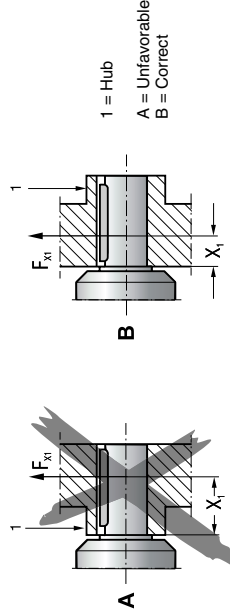
4.4 Gear unit with solid shaft

Installing input and output elements
The following figure shows a mounting device for installing couplings or hubs on gear unit or motor shaft ends. It may be possible to dispense with the thrust bearing on the mounting device.



03371BXX

Avoid impermissibly high overhung loads: Install the gear or chain sprocket according to figure B.



03369BXX

- Only use a mounting device for installing input and output elements. Use the center bore and the thread on the shaft end for positioning.
- **Never drive belt pulleys, couplings, pinions, etc. onto the shaft end by hitting them with a hammer. This will damage the bearings, housing and the shaft!**
- **In the case of belt pulleys, make sure the belt is tensioned correctly in accordance with the manufacturer's instructions.**
- Power transmission elements should be balanced after fitting and must not give rise to any impermissible radial or axial forces (see the "Gearmotor" or "Explosion-Proof Drives" catalogs for permitted values).



Note:

Assembly is easier if you first apply lubricant to the output element or heat it up briefly (to 80 ... 100 °C).

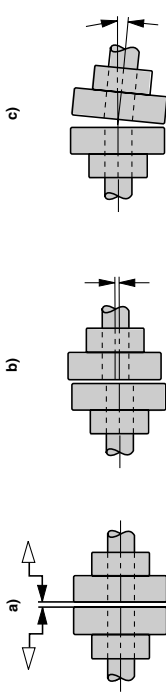


Mechanical Installation
Gear unit with solid shaft

Installing couplings

Couplings must be mounted and balanced according to the information provided by the coupling manufacturer:

- a) Maximum and minimum clearance
- b) Axial misalignment
- c) Angular misalignment



03356AXX

Figure 7: Clearance and misalignment for coupling installation



Input and output elements such as belt pulleys, couplings, etc. must be protected against contact!



Mechanical Installation
Torque arms for mounted gear units

4.5 Torque arms for mounted gear units

Do not place torque arms under strain during installation!

Parallel shaft helical gear units

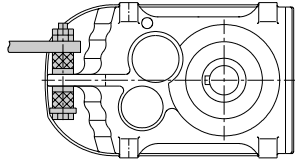


Figure 8: Torque arm for parallel shaft helical gear units
01029BXX

Helical-bevel gear units

- Bush with bearings on both ends → (1).
- Install connection end B as a mirror image of A.

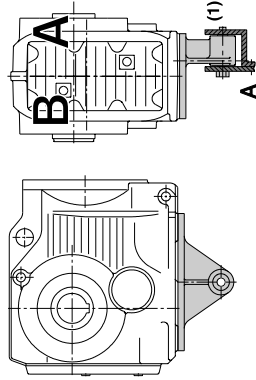


Figure 9: Torque arm for helical-bevel gear units
01030CXX

Gear unit	Bolts	Tightening torque
KA37	4 × M10 × 25 – 8.8	48 Nm
KA47	4 × M10 × 30 – 8.8	48 Nm
KA67	4 × M12 × 35 – 8.8	86 Nm
KA77	4 × M16 × 40 – 8.8	210 Nm
KA87	4 × M16 × 45 – 8.8	210 Nm
KA97	4 × M20 × 50 – 8.8	410 Nm
KA107	4 × M24 × 60 – 8.8	710 Nm
KA127	4 × M36 × 130 – 8.8	2500 Nm
KA157	4 × M36 × 130 – 8.8	2500 Nm



Mechanical Installation
Torque arms for mounted gear units

Helical-worm
gear units

- Bush with bearings on both ends → (1).

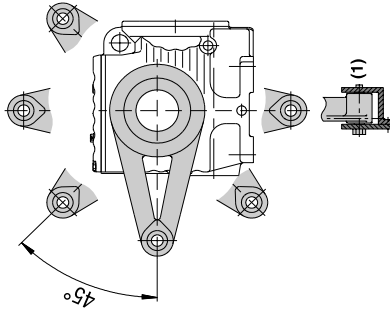


Figure 10: Torque arm for helical-worm gear units

01031CXX

Gear unit	Bolts	Tightening torque
SA37	M6 × 16 – 8.8	11 Nm
SA47	M8 × 20 – 8.8	25 Nm
SA57	M8 × 20 – 8.8	25 Nm
SA67	M12 × 25 – 8.8	86 Nm
SA77	M12 × 35 – 8.8	86 Nm
SA87	M16 × 35 – 8.8	210 Nm
SA97	M16 × 35 – 8.8	210 Nm

SPIROPLAN® W
gear units

- Bush with bearings on both ends → (1)

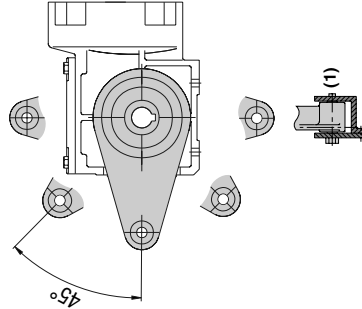


Figure 11: Torque arm for SPIROPLAN® W gear units

02050CXX

Gear unit	Bolts	Tightening torque
WA10	M6 × 16	11 Nm
WA20	M6 × 16	11 Nm
WA30	M6 × 16	11 Nm



Mechanical Installation
Mounted gear unit with keyway or splined hollow shaft

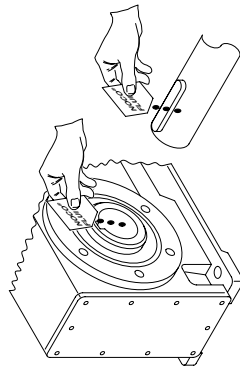
4.6 Mounted gear unit with keyway or splined hollow shaft



For the configuration of customer shafts, please also refer to the design notes in the Gearmotors catalog!

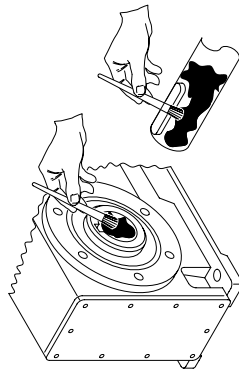
Installation notes

1. Apply NOCO® fluid.



02042BXX

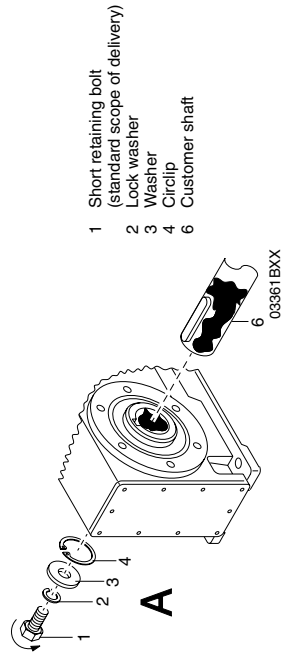
2. Distribute the NOCO® fluid carefully.



02043AXX

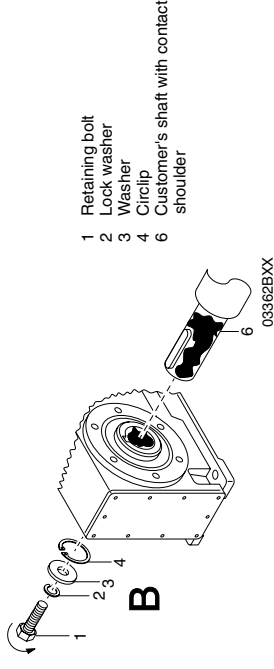
3. Install the shaft and secure it axially
(mounting is facilitated by using a mounting device)

3A: Mounting with standard scope of delivery

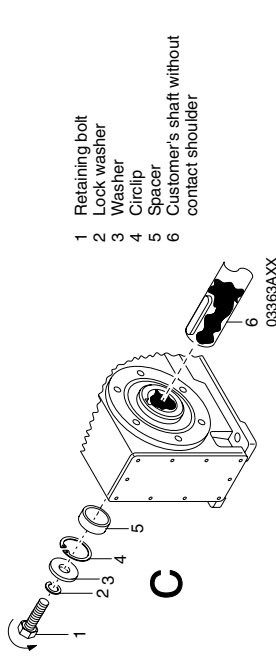




3B: Assembly with SEW-EURODRIVE assembly/disassembly kit (→ page 26)
– Customer's shaft **with** contact shoulder

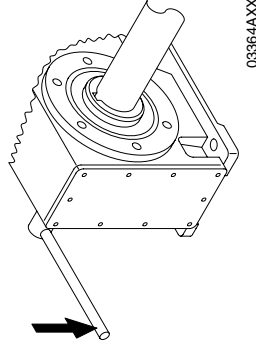


3C: Assembly with SEW-EURODRIVE assembly/disassembly kit (→ page 26)
– Customer's shaft **without** contact shoulder



4. Tighten the retaining bolt to the appropriate torque (see table).

Bolt	Tightening torque [Nm]
M5	5
M6	8
M10/12	20
M16	40
M20	80
M24	200



Note:

To avoid contact corrosion, we recommend that the customer's shaft should additionally be recessed between the two contact surfaces!





SEW
Installation/removal kit

The SEW-EURODRIVE installation/removal kit can be ordered under the following part number.

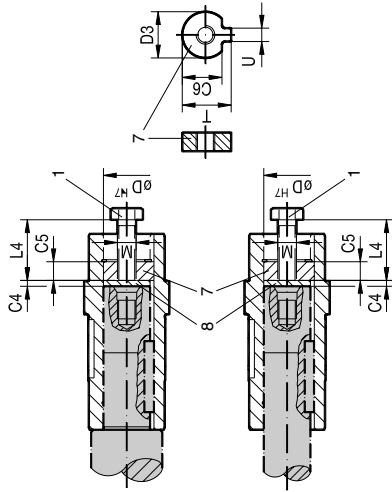


Figure 12: SEW-EURODRIVE Installation/removal kit

03394AXX

- 1 Retaining bolt
- 7 Fixed nut for disassembly
- 8 Forcing washer

Type	DH7 [mm]	M ¹⁾	C4 [mm]	C5 [mm]	C6 [mm]	U-0.5 [mm]	T-0.5 [mm]	D3-0.5 [mm]	L4 [mm]	Part number of installa- tion/removal kit
WA..10	16	M5	5	5	12	4.5	18	15.7	50	643 712 5
WA..20	18	M6	5	6	13.5	5.5	20.5	17.7	25	643 682 X
WA..20, WA..30, SA..37	20	M6	5	6	15.5	5.5	22.5	19.7	25	643 683 8
FA..27, SA..47	25	M10	5	10	20	7.5	28	24.7	35	643 684 6
FA..37, KA..37, SA..47, SA..57	30	M10	5	10	25	7.5	33	29.7	35	643 685 4
FA..47, KA..47, SA..57	35	M12	5	12	29	9.5	38	34.7	45	643 686 2
FA..57, KA..57, FA..67, KA..67, SA..67	40	M16	5	12	34	11.5	41.9	39.7	50	643 687 0
SA..67	45	M16	5	12	38.5	13.5	48.5	44.7	50	643 688 9
FA..77, KA..77, SA..77	50	M16	5	12	43.5	13.5	53.5	49.7	50	643 689 7
FA..87, KA..87, SA..77, SA..87	60	M20	5	16	56	17.5	64	59.7	60	643 690 0
FA..97, KA..97, SA..87, SA..97	70	M20	5	16	65.5	19.5	74.5	69.7	60	643 691 9
FA..107, KA..107, SA..97	90	M24	5	20	80	24.5	95	89.7	70	643 692 7
FA..127, KA..127	100	M24	5	20	89	27.5	106	99.7	70	643 693 5
FA..157, KA..157	120	M24	5	20	107	31	127	119.7	70	643 694 3

1) Retaining bolt

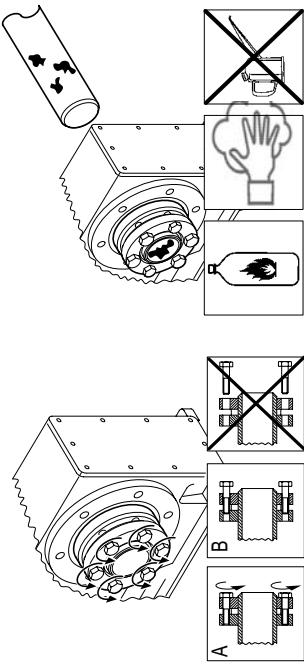
The SEW assembly kit for mounting the customer shaft is a recommendation from SEW-EURODRIVE. You must always check whether this design can compensate the axial loads. In particular applications (e.g. mounting mixer shafts), a different design may have to be used to secure the shaft axially. In these cases, customers can use their own devices. However, you must ensure that these designs do not cause potential sources of combustion according to DIN EN 13463 (for example, impact sparks).



4.7 Mounted gear units with shrink disc

Installation notes • Do not tighten the locking bolts unless the shaft is installed - the hollow shaft could become deformed!

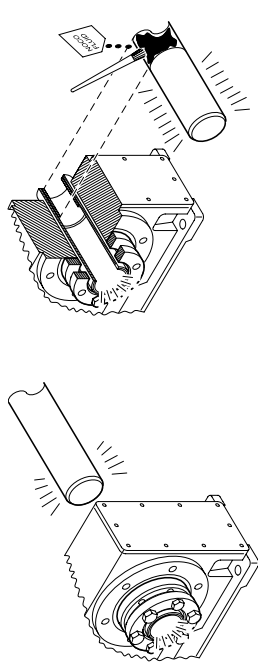
- 1. Loosen the locking bolts by a few turns (do not unscrew them completely!).
- 2. Carefully degrease the hollow shaft hole and the input shaft.



51092AXX

51093AXX

- 3. Hollow shaft/input shaft after degreasing
- 4. Apply NOCO® fluid to the input shaft¹⁾ in the area of the bushing.



51094AXX

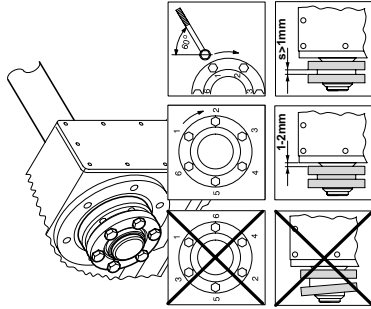
51095AXX



- 1) It is essential to make sure that the clamping area of the shrink disk is free from grease!
For this reason, never apply NOCO® fluid directly to the bushing as the paste may be able to get into the clamping area of the shrink disk when the input shaft is put on.



5. Install the input shaft, making sure that the locking collars of the shrink disk are installed in parallel to each other²⁾. For gear unit housing **with a shaft collar**, mount the **shrink disc to the stop on the shaft collar**. For gear unit housing **without a shaft collar**, mount the **shrink disc with a clearance of 1 to 2 mm from the gear unit housing**. Tighten the locking bolts with the torque wrench by working round several times from one bolt to the next (not in diametrically opposite sequence) until the bolts cannot be tightened any more. See the following table for tightening torques.



51096AXX

2)After installation

- There must be a gap $s > 1$ mm between the locking collars
- Grease the outside of the hollow shaft in the area of the shrink disk to prevent corrosion.



Gear unit type	Bolt	Nm	max. 1)
KH37...77	SH37	M5	5
	SH47...77	M6	12
KH87/97	FH87/97	M6	30
	SH87/97	M8	30
KH107	FH107	M10	59
KH127/157	FH127	M12	100
		M16	250
KH167		M20	470
KH187			

1) Maximum tightening angle per cycle



Notes on
removing the
shrink disk

1. Unscrew the locking bolts evenly one after the other. Each locking bolt may only be unscrewed by about one quarter turn in the initial cycle. This is in order to avoid tilting and jamming the locking collars. Do not fully unscrew the locking bolts!
2. Remove the shaft or pull the hub off the shaft. (You must first remove any rust that may have formed between the hub and the end of the shaft.)
3. Pull the shrink disk off the hub.



Caution!

Risk of injury if the shrink disk is not removed correctly!

Cleaning and
lubricating the
shrink disk

There is no need to strip down and re-grease disassembled shrink disks before they are screwed back on.

The shrink disk only needs to be cleaned and re-greased if it is contaminated.

Use one of the following solid lubricants for the tapered surfaces.

Lubricant (Mo S2)	Sold as
Molykote 321 (lube coat)	Spray
Molykote spray (powder spray)	Spray
Molykote G-Rapid	Spray or paste
Aemasil MO 19P	Spray or paste
Aemasil DIO-séral 57 N (lube coat)	Spray

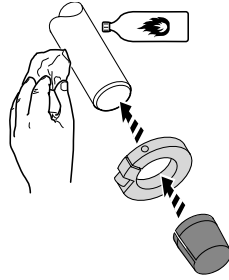
Grease the locking bolts with a multipurpose grease such as Molykote BR 2 or similar.



Mechanical Installation Mounted gear units with TorqLOC®

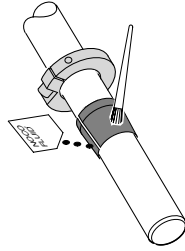
4.8 Mounted gear units with TorqLOC®

1. Clean the inside of the hollow shaft and the customer shaft. Ensure that all traces of grease or oil are removed.
2. Install the split ring and the bushing on the customer shaft.



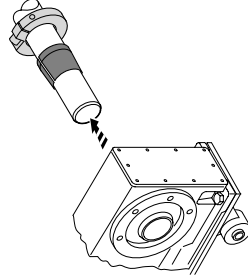
52089AXX

3. Apply NOCO® fluid to the bushing and distribute it carefully.



52090AXX

4. Push the gear unit onto the customer shaft.

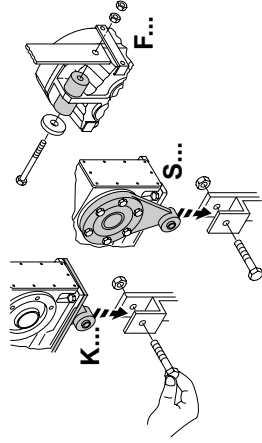


52091AXX



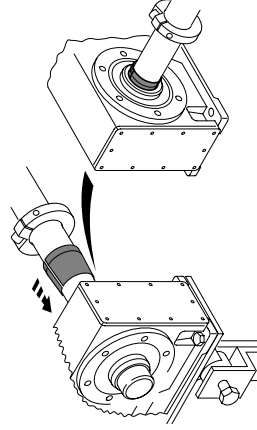
Mechanical Installation Mounted gear units with TorqLOC®

5. Preassemble the torque arm (do not tighten the bolts).



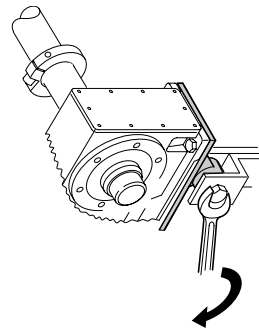
52092AXX

6. Push the busing onto the gear unit up to the stop.



52093AXX

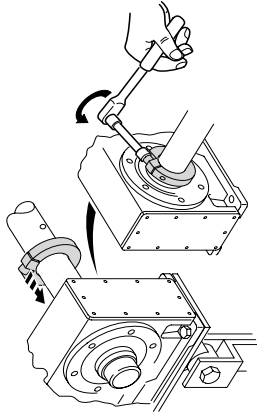
7. Tighten all the retaining bolts for the torque arm.



52094AXX



8. Secure the bushing with the split ring. Tighten the split ring on the bushing using the appropriate torque as specified in the following table.

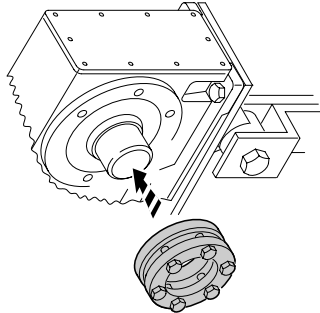


52095AXX

Type	Torque [Nm]		
	K7/FT	ST	Nickel plated
-	37	47	18
37	47	57	18
47	57	67	18
57, 67	67	77	35
77	77	87	35
87	87	97	35
97	97		35

Torque [Nm]	
Nickel plated	18
Stainless steel	7.5

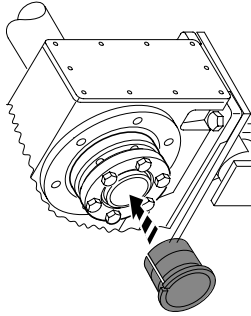
9. Slide the shrink disk onto the hollow shaft. Ensure that all bolts have been loosened.



52096AXX

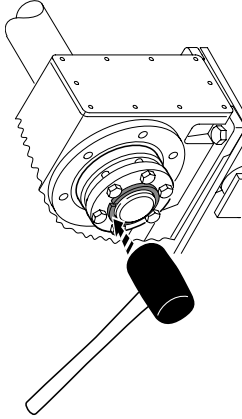


10. Push the counter bushing onto the customer shaft and into the hollow shaft or shrink disk right into the seat.



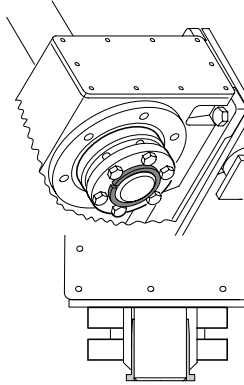
52097AXX

11. Tap lightly on the flange of the counter bushing to ensure that the socket is fitted securely in the hollow shaft.



52098AXX

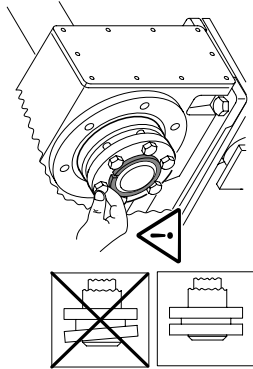
12. Ensure that the customer shaft is fitted in the counter bushing.



53478AXX



13. Tighten the bolts of the shrink disk by hand and ensure that the end rings of the shrink disc are parallel.

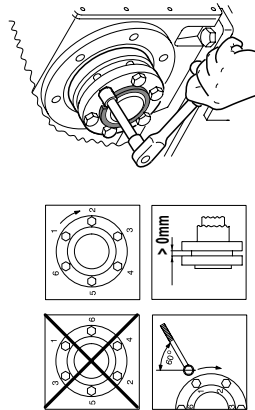


52100AXX

14. Tighten the locking bolts by working round several times from one bolt to the next (not in diametrically opposite sequence). See the table for tightening torques.



After installation, the remaining gap between the outer rings of the shrink discs must be > 0 mm.

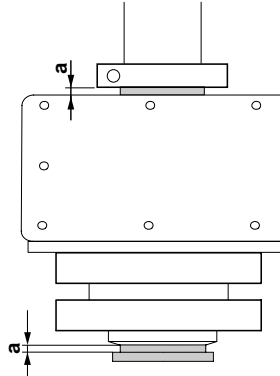


52101AXX

KT/FT	Type	ST	Torque [Nm]	
			Nickel plated	Stainless steel
-		37	4.1	6.8
37		47	10	6.8
47		57	12	6.8
57, 67		67	12	15
77		77	30	30
87		87	30	50
97		97	30	50



15. The distance between the counter bushing and the hollow shaft end and between the split ring and the clamping ring must not exceed the following values. The following table lists the maximum and minimum gap width.



52102AXX

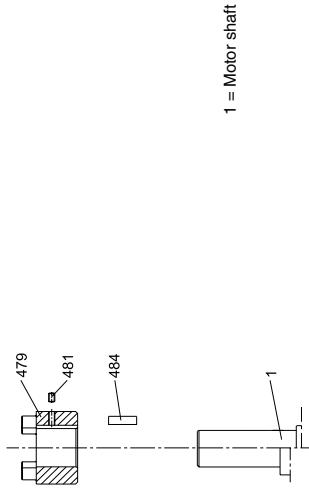
KT/FT	Type	ST	Distance [mm]	
			a min.	a max.
-		37	3.3	5.6
37		47	3.3	5.6
47		57	5.0	7.6
57, 67		67	5.0	7.6
77		77	5.0	7.6
87		87	5.8	8.6
97		97	5.8	8.6



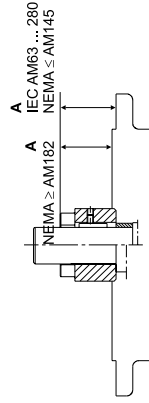
4.9 AM adapter coupling

IEC adapter AM63
225 / NEMA
adapter AM56
365

04469CXX



1 = Motor shaft



1. Clean the motor shaft and flange surfaces of the motor and adapter.
2. Remove the key from the motor shaft and replace it with the supplied key (484) (not AM63 and AM250).
3. Heat the coupling half (479) to approx. 80 – 100 °C, push the coupling half onto the motor shaft.
Until stop at motor shaft shoulder (position to point **A** except for AM25 / AM280 and NEMA).
4. Secure key and coupling half using grub screw (481) and tightening torque T_A on motor shaft according to the table.
5. Check point **A**.
6. Seal the contact surfaces between the adapter and motor using a suitable sealing compound.
7. Mount the motor on the adapter. When doing this, make sure the coupling dogs of the adapter shaft engage in the plastic spider.

IEC AM	63 / 71	80 / 90	100 / 112	132	160 / 180	200	225	250 / 280
A	24.5	31.5	41.5	54	76	78.5	93.5	139
T_A	1.5	1.5	4.8	4.8	10	17	17	17
Thread	M4	M4	M6	M6	M8	M10	M10	M10
NEMA AM	56	143 / 145	182 / 184	213 / 215	254 / 256	284 / 286	324 / 326	364 / 365
A	46	43	55	63.5	78.5	85.5	107	107
T_A	1.5	1.5	4.8	4.8	10	17	17	17
Thread	M4	M4	M6	M6	M8	M10	M10	M10



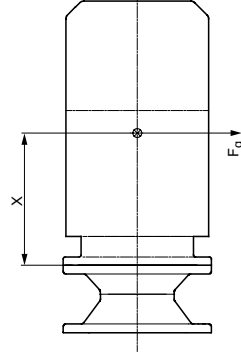
Permitted loads



To avoid contact corrosion, we recommend applying NOCO® fluid to the motor shaft before mounting the coupling half.

When installing a motor onto the adapter, you must use an anaerobic fluid seal to ensure that moisture cannot penetrate the adapter.

The load data specified in the following table must not be exceeded when a motor is mounted.



51102AXX

Adapter type		x^1 [mm]	F_q^1 [N]	
IEC	NEMA		IEC adapter	NEMA adapter
AM63/71	AM56	77	530	410
AM80/90	AM143/145	113	420	380
AM100/112	AM182/184	144	2000	1760
AM132 2)	AM213/215 2)	186	1600	1250
AM132..	AM213/215		4700	3690
AM160/180	AM254/286	251	4600	4340
AM200/225	AM324 - AM365	297	5600	5250
AM250/280	-	390	11200	-

1) The maximum permitted weight of the attached motor F_{qmax} must be reduced proportionally as the distance between the adapter flange and the middle of the motor (x) increases. When this distance is reduced, the maximum permitted weight F_{qmax} cannot be increased.

2) Diameter of the adapter drive flange: 160 mm



Mechanical Installation

AQ adapter coupling

Adapter AM with
backstop AM.../RS

Check the direction of rotation of the drive before installation and startup. Please inform the SEW-EURODRIVE customer service if the direction of rotation is incorrect.

The backstop is maintenance-free in operation, and does not require any further maintenance work.

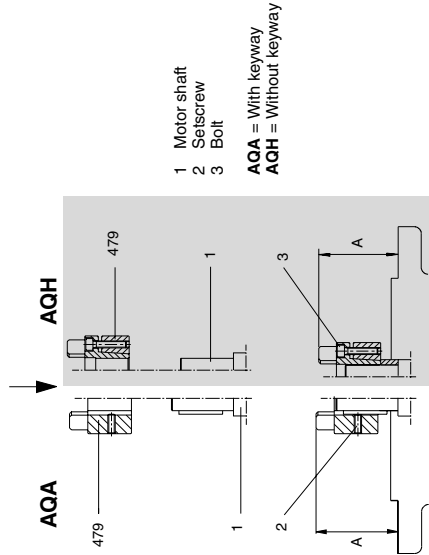
The backstops have a minimum lift-off speed depending on the size (→ following table). If the minimum lift-off speeds are violated, the backstops are subject to wear, and the resulting friction causes the temperature to increase.

Type	Maximum locking torque of backstop [Nm]	Minimum lift-off speed [1/min]
AM180/90/RS, AM143/145/RS	90	640
AM100/112/RS, AM182/184/RS	340	600
AM132/RS, AM2132/15/RS	700	550
AM160/180/RS, AM254/286/RS	1200	630
AM200/225/RS, AM324-365/RS	1450	430



In rated operation, the lift-off speeds must not drop below the minimum values. The lift-off speeds are only permitted to drop below the minimum values during start-up or braking.

4.10 AQ adapter coupling



53512AXX

1. Clean the motor shaft and flange surfaces of the motor and adapter.
2. **Type AQH:** Unscrew the bolts of the coupling half (479) and loosen the conical connection.
3. Heat the coupling half (80 °C – 100 °C) and push it onto the motor shaft.
Type AQA / AQH: Up to clearance "A" (see table).
4. **Type AQH:** Tighten the bolts on the coupling half in diametrically opposite sequence



Mechanical Installation

AQ adapter coupling

(work round several times tightening the bolts evenly one after the other) until all bolts reach the tightening torque T_A specified in the table.

Type AQA: Use a setscrew to secure the coupling half (see table).
5. Check the position of the coupling half (clearance "A", see table).

Install motor onto the adapter making sure that the dogs of the two coupling halves engage in each other. The force that must be applied when joining the two coupling halves is dissipated after final assembly, so there is no risk of any axial load being applied to adjacent bearings.



Only for AQA, not permitted for AQH: To avoid contact corrosion, we recommend applying NOCO® fluid to the motor shaft before mounting the coupling half.

When installing a motor onto the adapter, you must use an anaerobic fluid seal to ensure that moisture cannot penetrate the adapter.

Setting dimensions,
tightening
torques

Type	Coupling size	Clearance "A" [mm]	Bolts DIN 912 AQA	AQH	Tightening torque T_A [Nm] AQA	AQH
AQA / AQH 80 / 1/2/3	19/24	44.5	M5	M4	2	3
AQA / AQH 100 / 1/2		39				
AQA / AQH 100 / 3/4		53				
AQA / AQH 115 / 1/2		62				
AQA / AQH 115 / 3	24/28	62	M5	M5	2	6
AQA / AQH 140 / 1/2		62				
AQA / AQH 140 / 3	28/38	74.5	M8	M5	10	6
AQA / AQH 190 / 1/2		76.5				
AQA / AQH 190 / 3	38/45	100	M8	M6	10	10

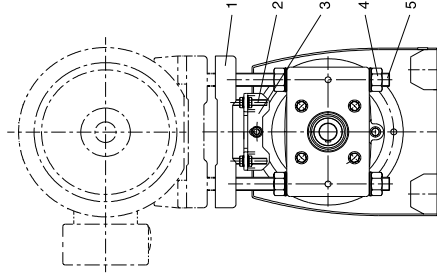


4.11 AD input shaft assembly

Please refer to Sec. "Installing input and output shafts" for information on mounting of input elements.

Mounting the motor and adjusting the motor mounting platform.

Cover with motor mounting platform AD../P



- 1 Motor mounting platform
- 2 Stud bolt (only AD6/P / AD7/P)
- 3 Support (only AD6/P / AD7/P)
- 4 Nut
- 5 Threaded column

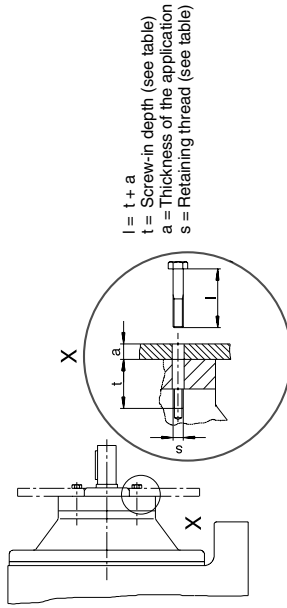
03519BXX

1. Set the motor mounting platform to the required mounting position by evenly tightening the adjusting nuts. It may be necessary to remove the lifting eyebolt from helical gear units in order to achieve the lowest adjustment position. Touch up any damage to the paint work.
 2. Align the motor on the motor mounting platform (shaft ends must be in alignment) and secure it.
 3. Mount the input elements on the input shaft end and the motor shaft. Line them up with one another. Correct the motor position again if necessary.
 4. Put on traction elements (V-belt, chain, etc.) and apply a preload by evenly adjusting the motor mounting platform. Do not stress the motor mounting platform and the columns against one another when doing this.
 5. Tighten the threaded columns using the nuts which are not used for adjustment.
- Unscrew the nuts on the stud bolts before adjustment to allow the stud bolts to move axially in the support without restriction. Do not tighten the nuts until the final adjustment position has been achieved. Do not adjust the motor mounting platform using the support.

Only AD6/P and AD7/P:

Type with centering shoulder AD../ZR

- Mounting applications on the input shaft assembly with centering shoulder.
1. Retaining bolts of a suitable length must be used to secure the application. The length l of the new bolts is calculated as follows:



02725CXX

Round down the calculated bolt length to the next smaller standard length.

2. Remove the retaining bolts from the centering shoulder.
3. Clean the contact surface and the centering shoulder.
4. Clean the threads of the new bolts and apply a bolt locking compound (e.g. Loctite 243) to the first few threads.
5. Position the application against the centering shoulder and tighten the retaining bolts to the specified tightening torque T_A (see table).

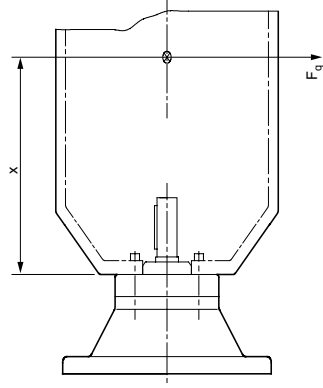
Type	Screw-in depth t [mm]	Retaining thread s	T_A for connection bolts in strength class 8.8 [Nm]
AD2ZR	25.5	M8	25
AD3ZR	31.5	M10	48
AD4ZR	36	M12	86
AD5ZR	44	M12	86
AD6ZR	48.5	M16	210
AD7ZR	49	M20	410
AD8ZR	42	M12	86



Permitted loads



The load values specified in the following table must not be exceeded.



53513AXX

Type	x ¹⁾ [mm]	F _q ¹⁾ [N]
AD2/ZR	193	330
AD3/ZR	274	1400
AD4/ZR ²⁾	361	1120
AD4/ZR		3300
AD5/ZR	487	3200
AD6/ZR	567	3900
AD7/ZR	663	10000
AD8/ZR	516	4300

- 1) Maximum load values for connection bolts in strength class 8.8. The maximum permitted weight of the attached motor F_{qmax} must be reduced proportionally as the distance between the adapter flange and the middle of the motor (x) increases. When this distance is reduced, the F_{qmax} cannot be increased.
- 2) Diameter of the adapter output flange: 160 mm

Cover with back-stop AD../RS

Check the direction of rotation of the drive before installation and startup. Please inform the SEW-EURODRIVE customer service if the direction of rotation is incorrect.

The backstop is maintenance-free in operation, and does not require any further maintenance work.

The backstops have a minimum lift-off speed depending on the size (→ following table). If the minimum lift-off speeds are violated, the backstops are subject to wear, and the resulting friction causes the temperature to increase.

Type	Maximum locking torque of backstop [Nm]	Minimum lift-off speed [1/min]
AD2/RS	90	640
AD3/RS	340	600
AD4/RS	700	550
AD5/RS	1200	630
AD6/RS	1450	430
AD7/RS	1450	430
AD8/RS	2860	430



In rated operation, the lift-off speeds must not drop below the minimum values. The lift-off speeds are only permitted to drop below the minimum values during start-up or braking.



Startup
Startup of helical-worm and SPIROPLAN® W gear units

5 Startup



Prior to startup check that the oil level is as specified for the mounting position. The oil checking and drain screws and the breather valves must be freely accessible.

5.1 Startup of helical-worm and SPIROPLAN® W gear units



Note: The direction of rotation of the output shaft in series S..7 helical-worm gear units has been changed from CW to CCW; this is different from the S..2 series. Change direction of rotation: Swap over two motor feeder cables.

Run-in period

SPIROPLAN® and helical-worm gear units require a run-in period of at least 24 hours before reaching their maximum efficiency. A separate run-in period applies for each direction of rotation if the gear unit is operated in both directions of rotation. The table shows the average power reduction during the run-in period.

No. of starts	Worm		Spiroplan®	
	Power reduction	i range	Power reduction	i range
1 start	ca. 12 %	ca. 50...280	ca. 15 %	approx. 40 ... 75
2 start	ca. 6 %	ca. 20...75	ca. 10 %	ca. 20...30
3 start	ca. 3 %	ca. 20...90	ca. 8 %	ca. 15
4 start	-	-	ca. 8 %	ca. 10
5 start	ca. 3 %	ca. 6...25	ca. 5 %	ca. 8
6 start	ca. 2 %	ca. 7...25	-	-

5.2 Startup of helical, parallel shaft helical and helical-bevel gear units

No special startup instructions are required for helical, parallel shaft helical and helical-bevel gear units providing the gear units have been installed in accordance with Sec. "Mechanical Installation".



Inspection and Maintenance
Inspection and maintenance intervals

6 Inspection and Maintenance

6.1 Inspection and maintenance intervals

Frequency	What to do?
<ul style="list-style-type: none">• Every 3000 machine hours, at least every 6 months.	<ul style="list-style-type: none">• Check oil and oil level.• Check the seals visually for leakage.• For gear units with a torque arm: Check the rubber buffer and change it, if necessary
<ul style="list-style-type: none">• Depending on the operating conditions (see chart below), every 3 years at the latest.• According to oil temperature.	<ul style="list-style-type: none">• Change mineral oil.• Replace anti-friction bearing grease (recommendation).• Replace oil seal (do not install it in the same track).
<ul style="list-style-type: none">• Depending on the operating conditions (see chart below), every 5 years at the latest.• According to oil temperature.	<ul style="list-style-type: none">• Change synthetic oil• Replace anti-friction bearing grease (recommendation).• Replace oil seal (do not install it in the same track).
<ul style="list-style-type: none">• Gear units R07, R17, R27, F27 and Spiroplan® are have lubrication for life and are therefore maintenance-free	
<ul style="list-style-type: none">• Varying (depending on external factors).	<ul style="list-style-type: none">• Touch up or renew the surface/anticorrosion coating.

6.2 Lubricant change intervals

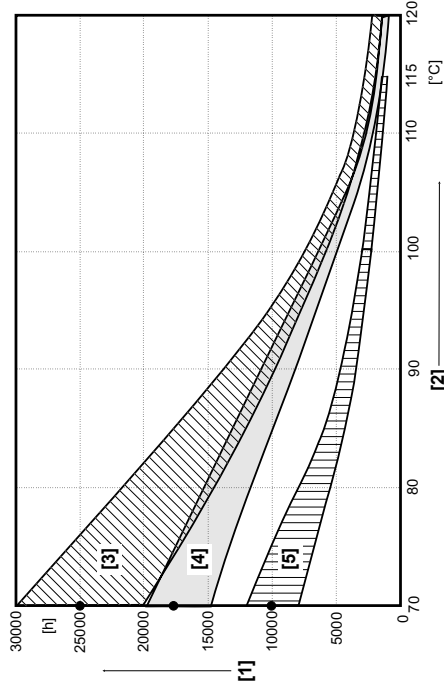


Figure 13: Oil change intervals for standard gear units under normal environmental conditions
53232AXX

- [1] Operating hours
- [2] Sustained oil bath temperature
- Average value per oil type at 70 °C
- [3] CLP PG
- [4] CLP HC / HCE II
- [5] CLP / HLP / E



6.3 Inspection and maintenance of the gear unit

Do not intermix synthetic lubricants and do not mix synthetic and mineral lubricants together!

The standard lubricant is mineral oil (except for Spiroplan® gear units).

The position of the oil level and oil drain plug and the breather valve depends on the mounting position. Refer to the diagrams of the mounting positions.

Checking the oil level



1. **De-energize the gearmotor and secure it to prevent it from being switched on inadvertently!**
Wait until the gear unit has cooled off – Danger of burns!
2. Refer to Sec. "Installing the gear unit" when changing the mounting position!
3. For gear units with an oil level plug: Remove the oil level plug, check the fill level and correct it if necessary. Screw the oil level plug back in.

Checking the oil



1. **De-energize the gearmotor and secure it to prevent it from being switched on inadvertently!**
Wait until the gear unit has cooled off – Danger of burns!
2. Remove a little oil from the oil drain plug.
3. Check the oil consistency.
 - Viscosity
 - If you can see that the oil is heavily contaminated, we recommend that you change the oil even if this is outside the service intervals specified in "Inspection and maintenance periods".
4. For gear units with an oil level plug: Remove the oil level plug, check the fill level and correct it if necessary. Screw the oil level plug back in.

Changing the oil



With oil drain plug / oil level screw

Only change the oil when the gear unit is at operating temperature.

De-energize the gearmotor and secure it to prevent it from being switched back on inadvertently!

Wait until the gear unit cools down - Danger of burns!

Note: The gear unit must still be warm otherwise the high viscosity of excessively cold oil will make it harder to drain the oil correctly.

1. Place a container underneath the oil drain plug
2. Remove the oil level plug, breather plug/breather valve and oil drain plug.
3. Drain all the oil.
4. Screw in the oil drain plug.
5. Pour in new oil of the same type through the vent hole (if changing the oil type, please first contact our customer service). Do not mix synthetic lubricants.
 - Pour in the volume of oil in accordance with the mounting position (see Sec. "Lubricant fill quantities") or as specified on the nameplate.
 - Check at the oil level plug.
6. Screw the oil level plug back in
7. Screw in the breather plug/breather valve.



Without oil drain plug / oil level plug

1. Remove cover plate.
2. Drain the oil through the cover plate opening.
3. Pour in new oil of the same type through the vent hole (if changing the oil type, please first contact our customer service). Do not mix synthetic lubricants.
 - Pour in the volume of oil in accordance with the mounting position (see Sec. "Lubricant fill quantities") or as specified on the nameplate.
4. Check the oil level (→ Sec. "Check oil level for gear units with oil level plug")
5. Attach cover plate (observe the tightening torque and series → Sec. "Check the oil level for gear units without an oil level plug")

Changing the oil seal



1. **De-energize the gearmotor and secure it to prevent it from being switched on inadvertently!**
Wait until the gear unit has cooled off – Danger of burns!
2. When changing the oil seal, ensure that there is a sufficient grease reservoir between the dust lip and protective lip, depending on the type of gear unit.
3. If you use double oil seals, the space has to be filled one-third with grease.

6.4 Inspection / maintenance of AM / AQA adapters

Frequency	What to do?
• Every 3000 machine hours, at least every 6 months	<ul style="list-style-type: none"> • Check torsional play • Visually check the elastic annular gear • Check the adapter visually for leakage
• After 25000 - 30000 machine hours	<ul style="list-style-type: none"> • Renew the anti-friction bearing grease • Replace oil seal (do not install it in the same track) • Change the elastic annular gear.

6.5 Inspection / maintenance of AD adapters

Frequency	What to do?
• Every 3000 machine hours, at least every 6 months	<ul style="list-style-type: none"> • Check running noise for possible bearing damage • Check the adapter visually for leakage
• After 25000 - 30000 machine hours	<ul style="list-style-type: none"> • Renew the anti-friction bearing grease • Change the oil seal



Malfunctions

Gear unit malfunctions

7 Malfunctions

Customer service

Please have the following information to hand if you require the assistance of our customer service:

- Data from the nameplate (complete)
- Nature and extent of the fault
- Time and peripheral circumstances of the fault
- Presumed cause

7.1 Gear unit malfunctions

Problem	Possible cause	Remedy
Unusual, regular running noise	A Meshing/grinding noise: Bearing damage, B Knocking noise: Irregularity in the gearing	A Check the oil (see Sec. "Inspection and Maintenance"), change bearings B Contact customer service
Unusual, irregular running noise	Foreign bodies in the oil	<ul style="list-style-type: none"> • Check the oil (see Sec. "Inspection and Maintenance") • Stop the drive, contact customer service
Oil leaking ¹⁾ <ul style="list-style-type: none"> • From the gear cover plate • From the motor flange • From the motor oil seal • From the gear unit flange • From the output end oil seal 	A Rubber seal on the gear cover plate leaking B Seal defective C Gear unit not vented	A Tighten the bolts on the gear cover plate and observe the gear unit. Oil still leaking: Contact customer service B Contact customer service C Vent the gear unit (see Sec. "Mounting Positions")
Oil leaking from breather valve	A Too much oil B Drive operated in incorrect mounting position C Frequent cold starts (oil foams) and/or high oil level	A Correct the oil level (see Sec. "Inspection and Maintenance") B Mount the breather valve correctly (see Sec. "Mounting Positions") and correct the oil level (see "Lubricants")
Output shaft does not turn although the motor is running or the input shaft is rotated	Connection between shaft and hub in gear unit interrupted	Send in the gear unit/gearmotor for repair

1) Short-term oil/grease leakage at the oil seal is possible in the run-in phase (24 hours running time).

7.2 AM / AQA / AL adapter malfunctions

Problem	Possible cause	Remedy
Unusual, regular running noise	Meshing/grinding noise: Bearing damage	Contact SEW-EURODRIVE customer service
Oil leaking	Seal defective	Contact SEW-EURODRIVE customer service
Output shaft does not turn although the motor is running or the input shaft is rotated	Connection between shaft and hub in gear unit interrupted	Send the gear unit to SEW-EURODRIVE for repair.
Change in running noise and / or vibrations occur	A Annular gear wear, short-term torque transfer through metal contact B Bolts to secure hub axially are loose.	A Change the annular gear B Tighten the bolts
Prenature wear in annular gear	A Contact with aggressive fluids / oil; ozone influence; too high ambient temperatures etc. which can cause a change in the physical properties of the annular gear. B Impermissibly high ambient/contact temperature for the annular gear; maximum permitted temperature -20 °C to +80 °C. C Overload	Contact SEW-EURODRIVE customer service



Malfunctions

AD input shaft assembly malfunctions

7.3 AD input shaft assembly malfunctions

Problem	Possible cause	Remedy
Unusual, regular running noise	Meshing/grinding noise: Bearing damage.	Contact SEW-EURODRIVE customer service
Oil leaking	Seal defective	Contact SEW-EURODRIVE customer service
Output shaft does not turn although the input shaft is rotated.	Connection between shaft and hub in gear unit or cover interrupted	Send the gear unit to SEW-EURODRIVE for repair.

8 Mounting Positions

8.1 General information on mounting positions

Mounting position designation

SEW differentiates between six mounting positions M1 ... M6 for gear units. The following figure shows the spatial orientation of the gearmotor in mounting positions M1 ... M6.

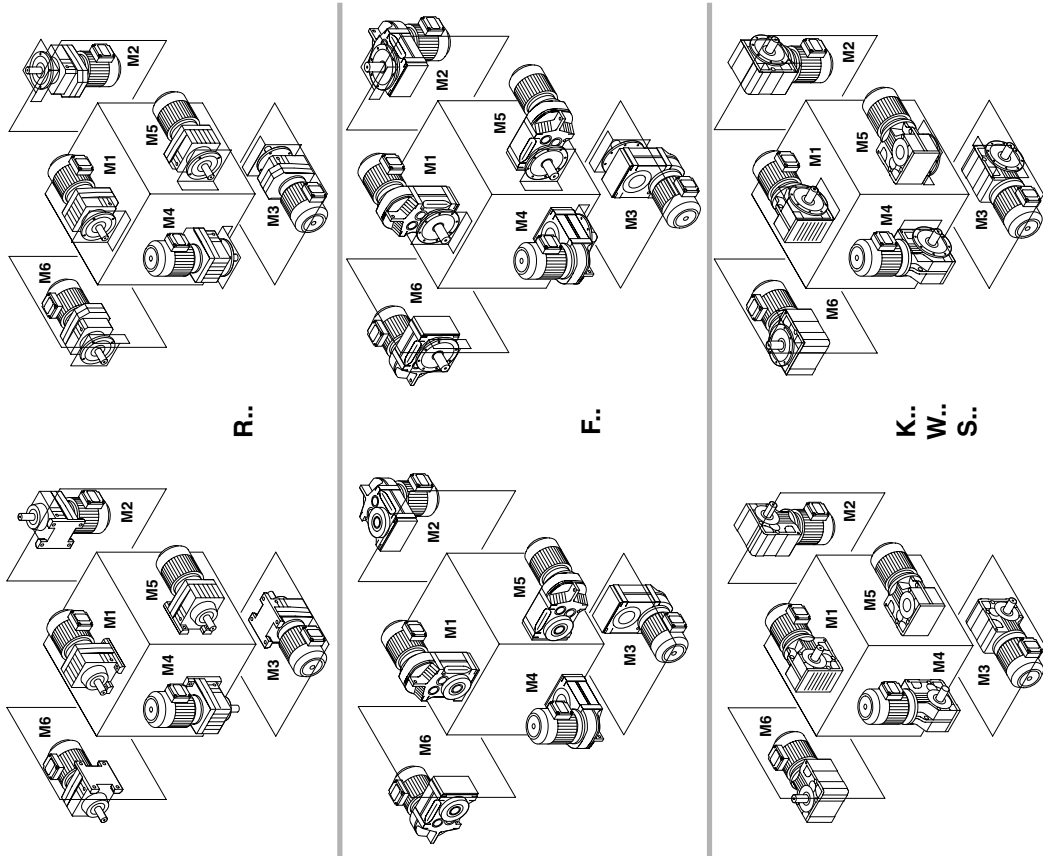


Figure 14: Depiction of mounting positions M1 ... M6

03203AXX

8.2 Key to the mounting position sheets



SPIROPLAN® gearmotors do not depend on any particular mounting position. However, mounting positions M1 to M6 are also shown for SPIROPLAN® gearmotors to assist you in working with this documentation.

Important: SPIROPLAN® gearmotors cannot be equipped with breather valves, oil level plugs or drain plugs.

Symbols used

The following table shows the symbols used in the mounting position sheets and what they mean:

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug

Churning losses



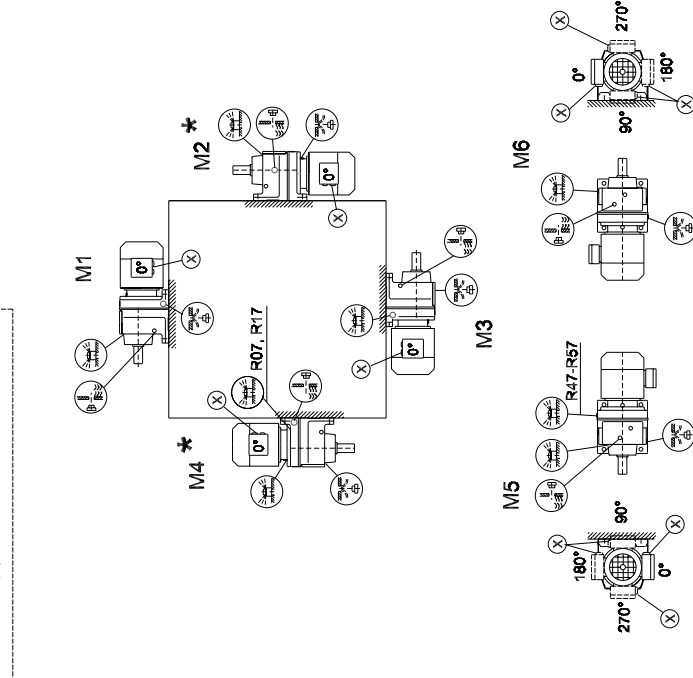
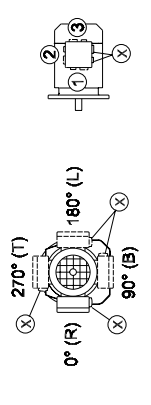
Increased churning losses may arise in some mounting positions. Contact SEW-EURODRIVE in case of the following combinations:

Mounting position	Gear unit type	Gear unit size	Input speed [1/min]
M2, M4	R	97 ... 107	> 2500
		> 107	> 1500
M2, M3, M4, M5, M6	F	97 ... 107	> 2500
		> 107	> 1500
	K	77 ... 107	> 2500
	S	> 107	> 1500
		77 ... 97	> 2500

8.3 Mounting positions for R helical gearmotors

R07-R167

04 040 200



R07

~~⊗~~

M1, M2, M3, M5, M6

R17. R27

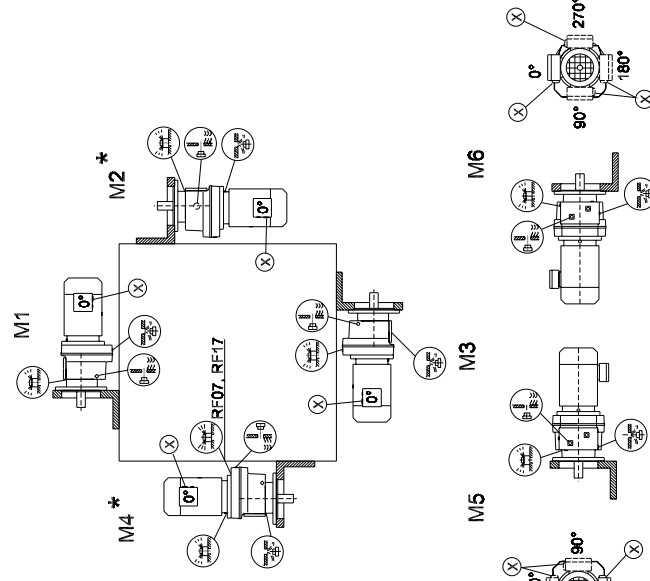
R07, R17, R27

R47, R57

★ → page 51

RF07-RF167

04 041 200



RF07

 M1, M2, M3, M5, M6

RF17, RF27
M1, M3, M5, M6

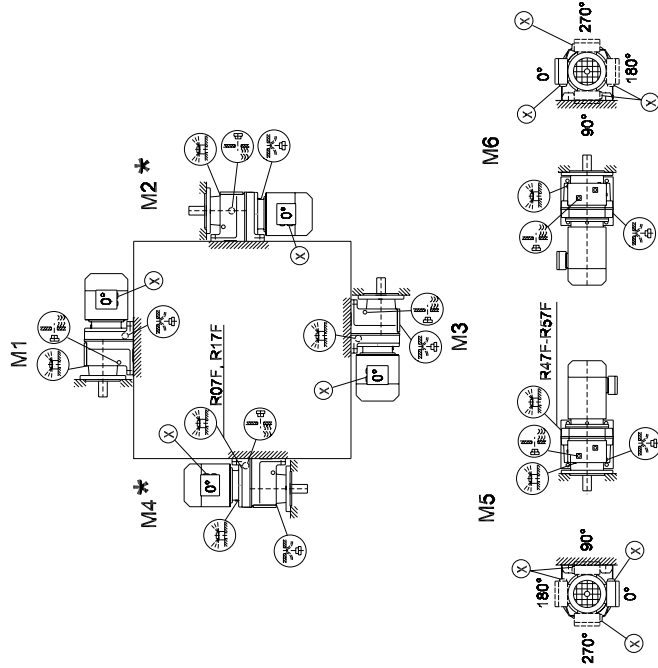
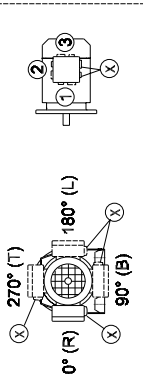
RF07. RF17. RF27

RF47, RF57

★ → page 51

R07F-R87F

04 042 200



- R07F
- R17F, R27F
- R07F, R17F, R27F
- R47F, R57F
- M1, M2, M3, M5, M6
- M1, M3, M5, M6
- M5

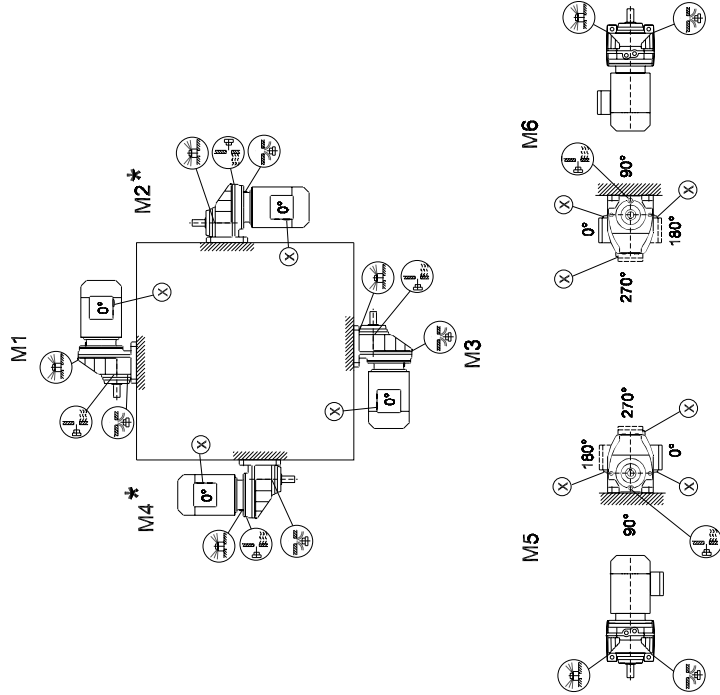
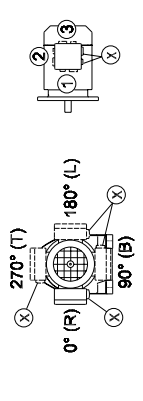
* → page 51

Important: See the  information in the "Gearmotors" catalog, section "Project Planning for Gear Units/Overhung and axial loads."

8.4 Mounting positions of RX helical gearmotors

RX57-RX107

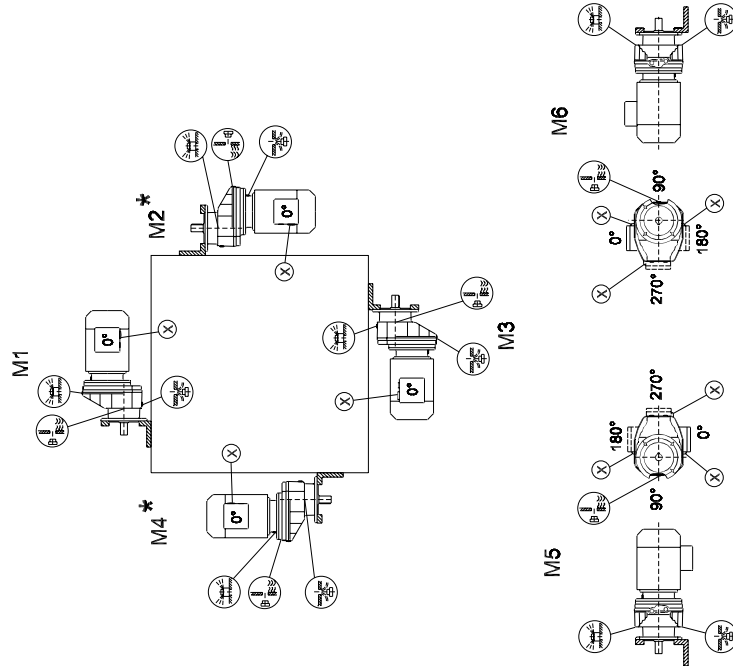
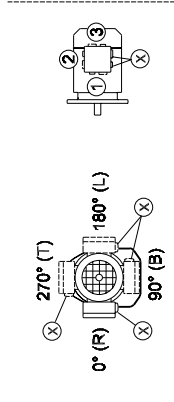
04 043 200



* → page 51

RXF57 - RXF107

04 044 200

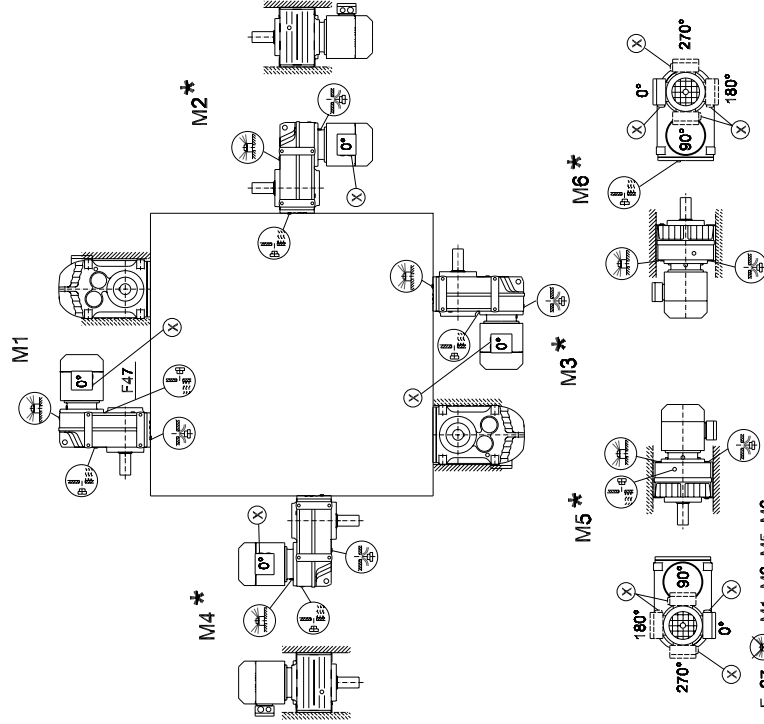
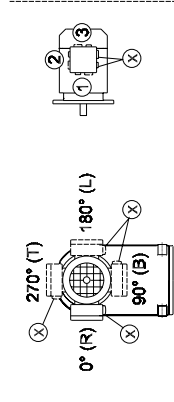


* → page 51

8.5 Mounting positions for parallel shaft helical gearmotors

F/FA..B/FH27B-157B, FV27B-107B

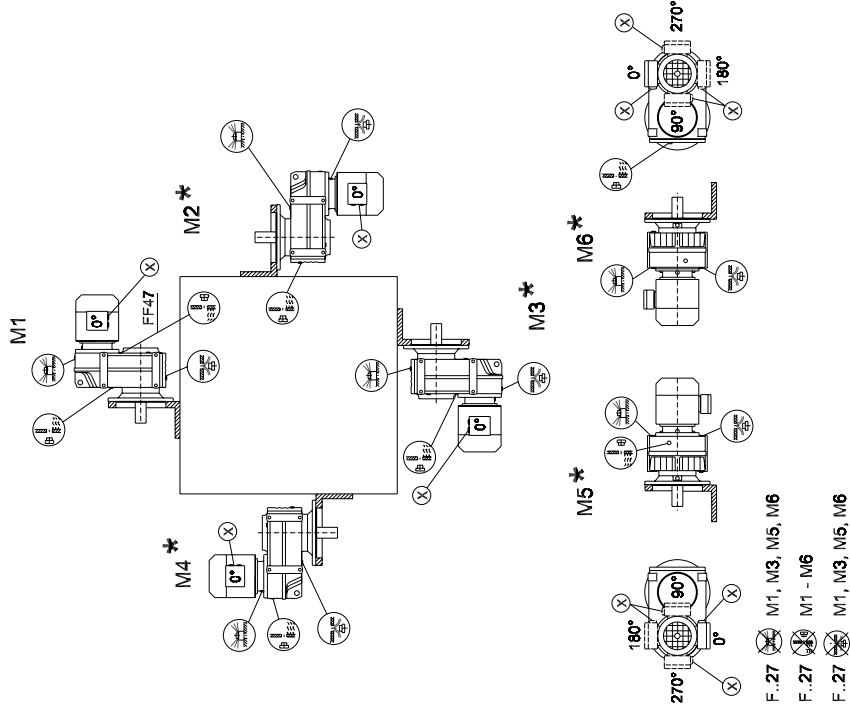
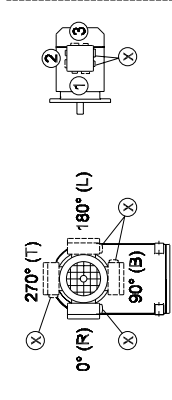
42 042 200



* → page 51

FF/FA/FHF/FAZ/FHZ27-157, FV/FVZ27-107

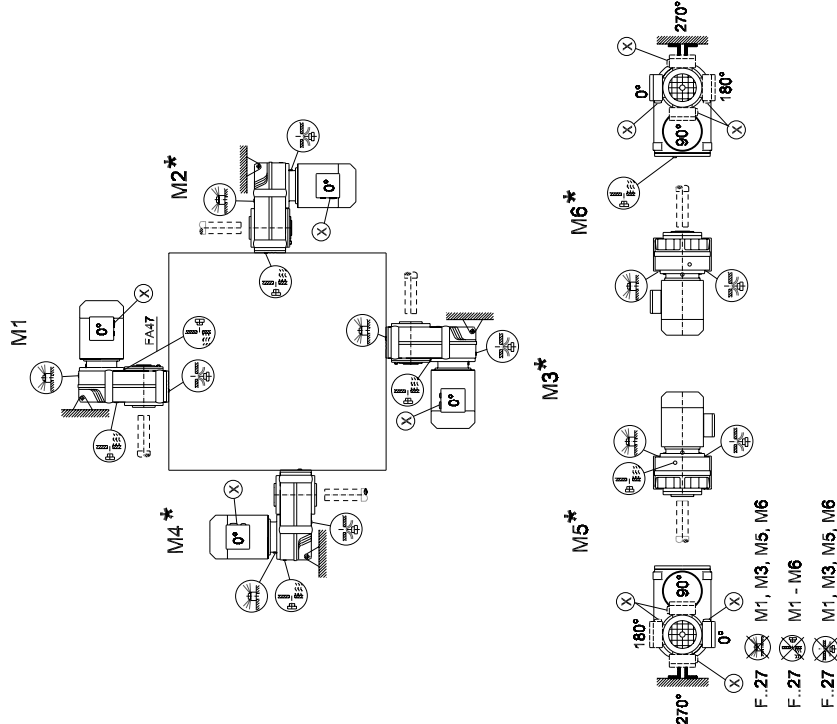
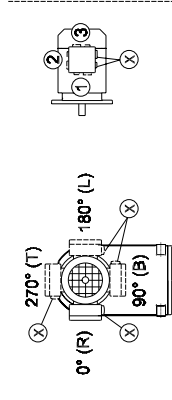
42 043 200



* → page 51

FA/FH27-157, FV27-107, FT37-97

42 044 200

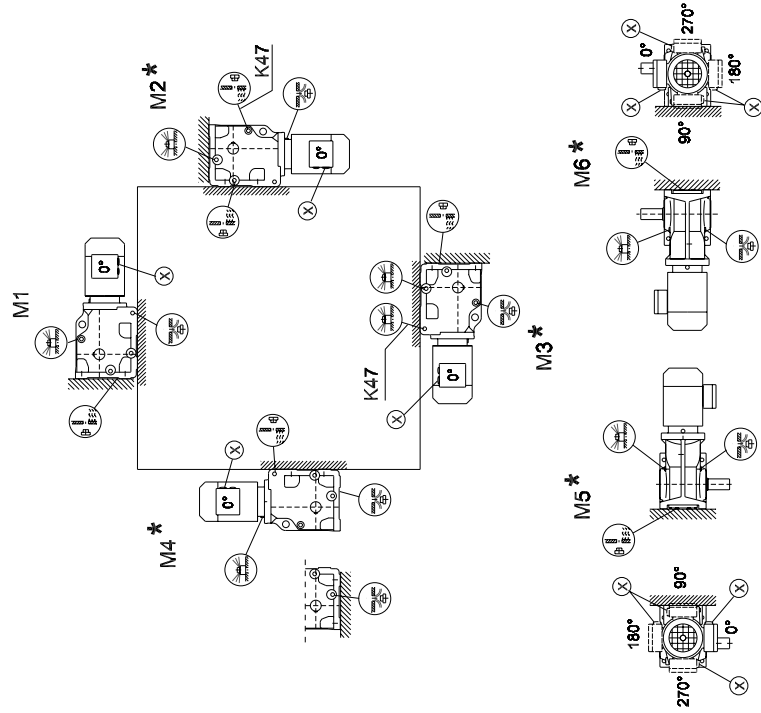
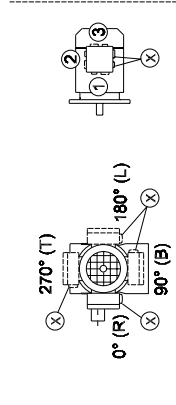


* → page 51

8.6 Mounting positions for helical-bevel gearmotors

K/KA...B/KH37B-157B, KV37B-107B

34 025 200

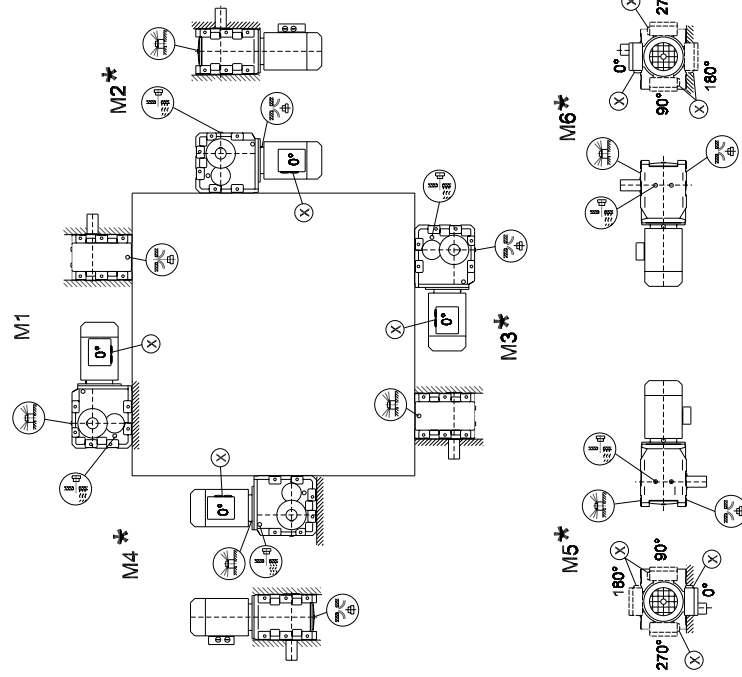
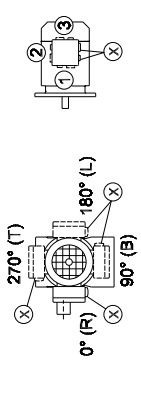


* → page 51

Important: See the **1** information in the "Gearmotors" catalog, section "Project Planning for Gear Units/Overhung and axial loads."

K167-187, KH167B-187B

34 026 200

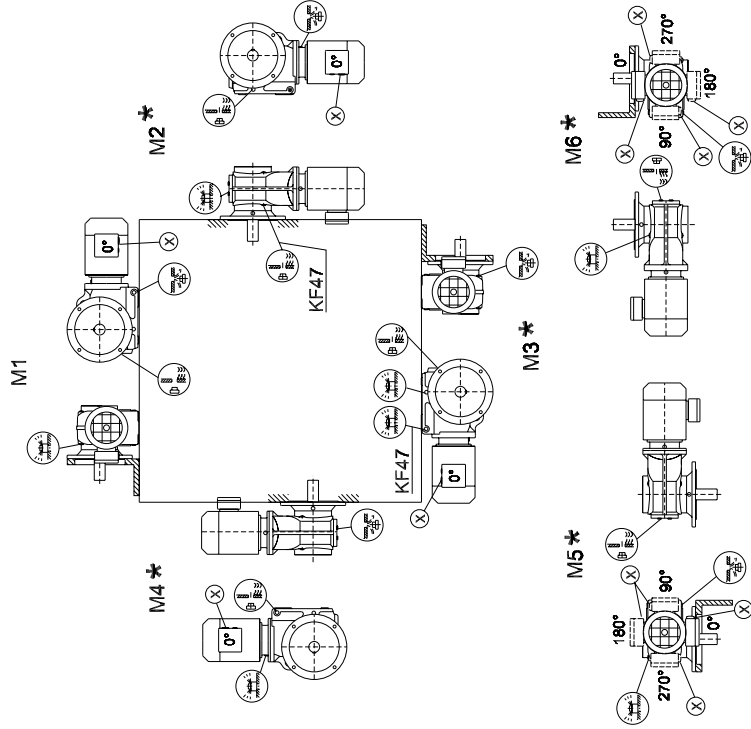
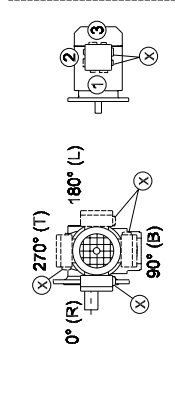


* → page 51

Important: See the **1** information in the "Gearmotors" catalog, section "Project Planning for Gear Units/Overhung and axial loads."

KE/KAF/KHF/KAZ/KHZ37-157, KVF/KVZ37-107

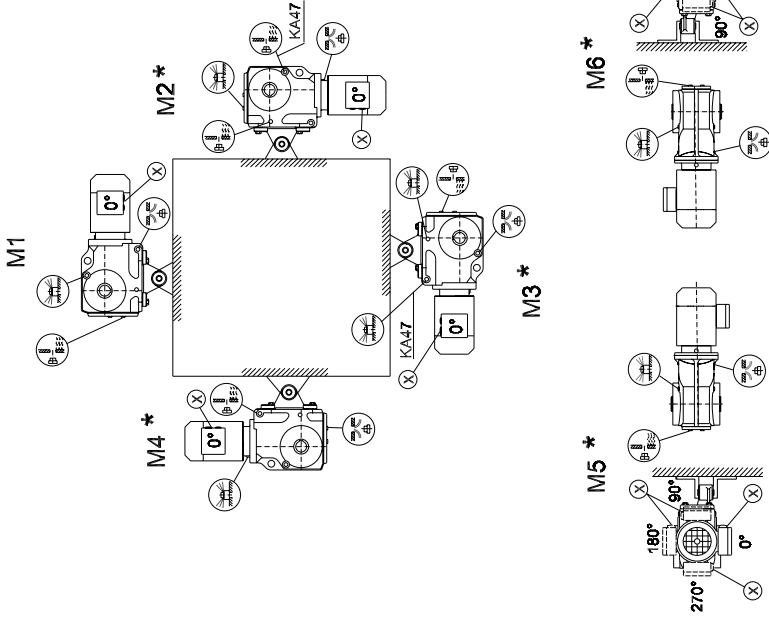
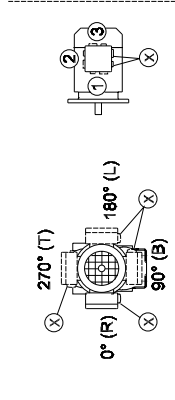
34 027 200



* → page 51

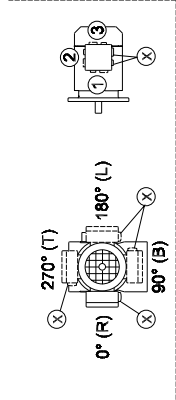
KA/KH37-157, KV37-107, KT37-97

39 025 200

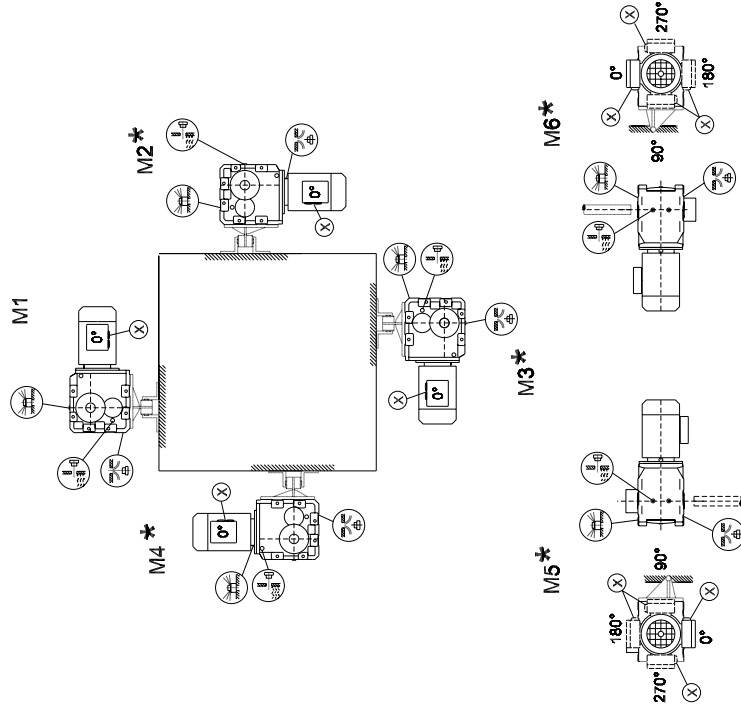


* → page 51

KH167-187



39 026 200

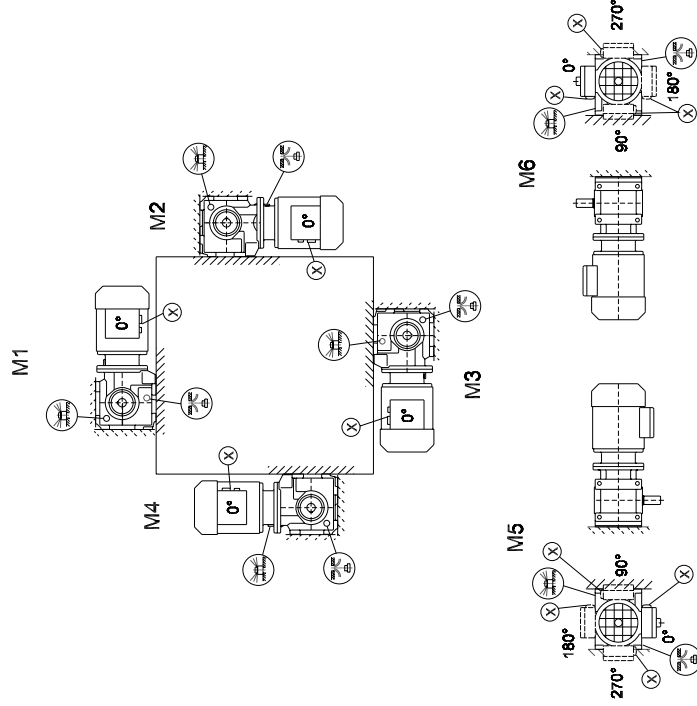
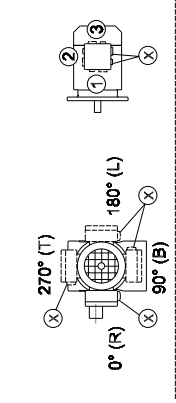


* → page 51

8.7 Mounting positions for helical-worm gearmotors

S37

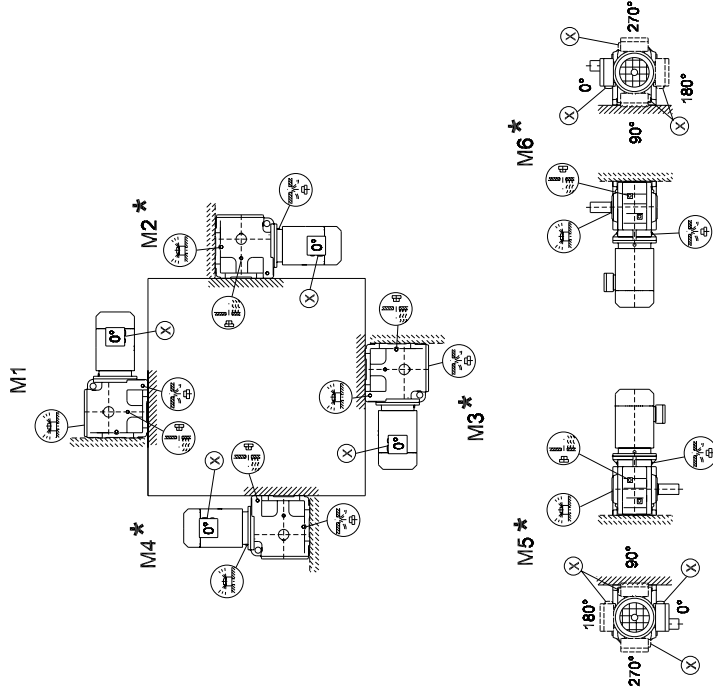
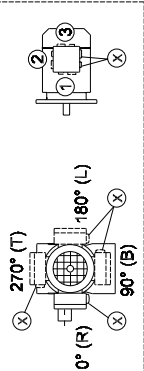
05 025 200



Important: See the **i** information in the "Gearmotors" catalog, section "Project Planning for Gear Units/Overhung and axial loads."

S47 - S97

05 026 200

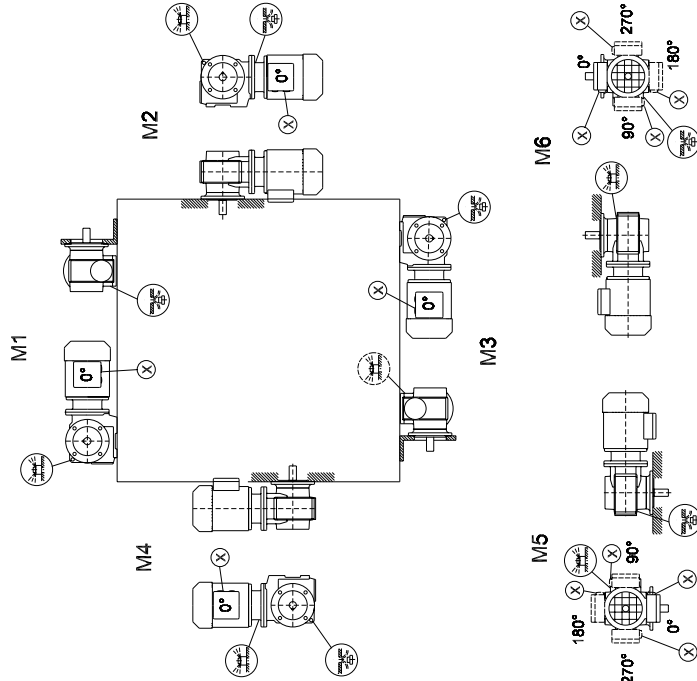
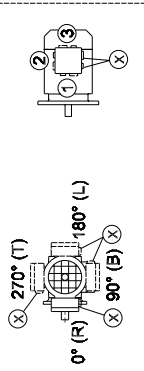


* → page 51

Important: See the  information in the "Gearmotors" catalog, section "Project Planning for Gear Units/Overhung and axial loads."

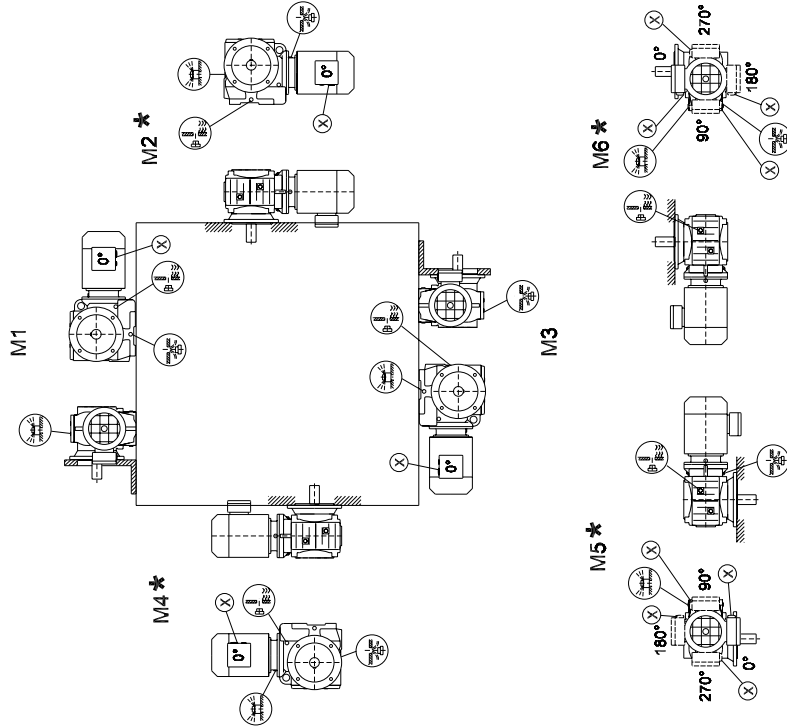
SF/SAF/SHF37

05 027 200



SF/SAF/SHF/SAZ/SHZ47-97

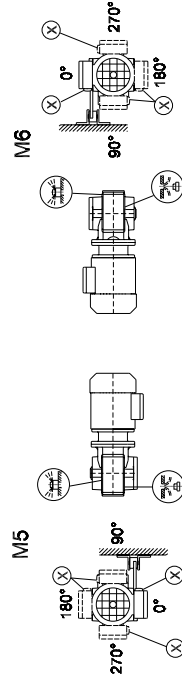
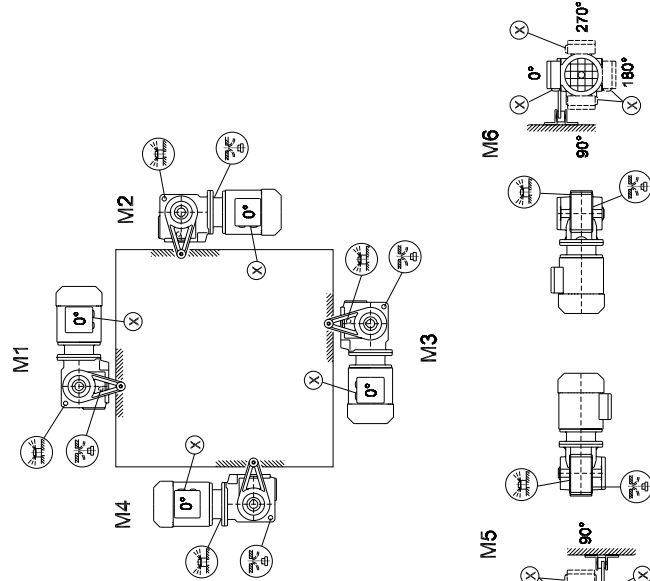
05 028 200



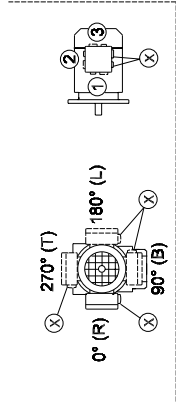
* → page 51

SA/SH/ST37

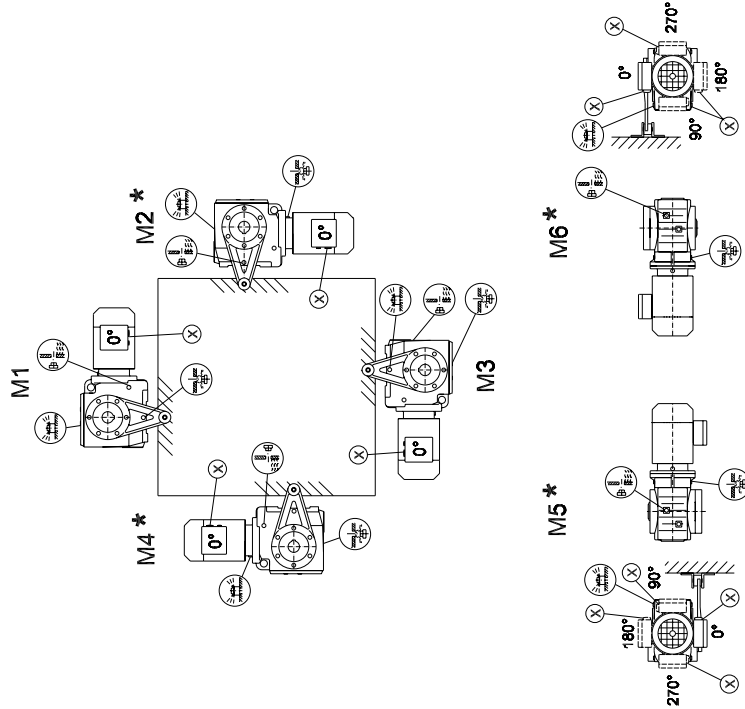
28 020 200



SA/SH/ST47-97



28 021 200

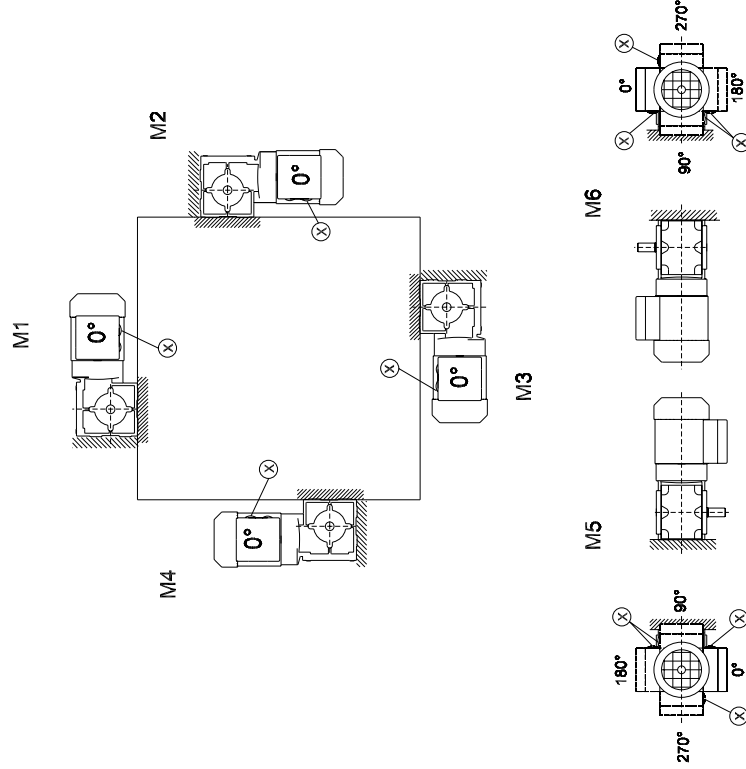
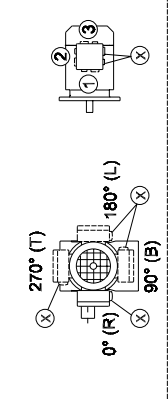


* → page 51

20 001 002

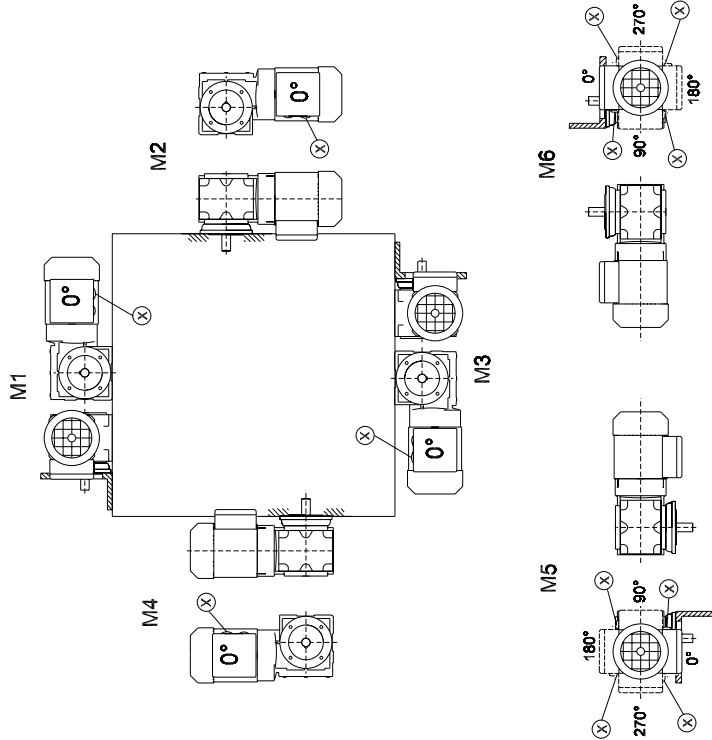
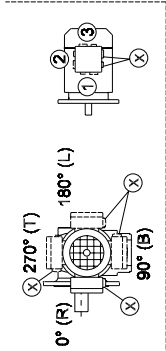
8.8 Mounting positions for SPIROPLAN® W gearmotors

W10-30



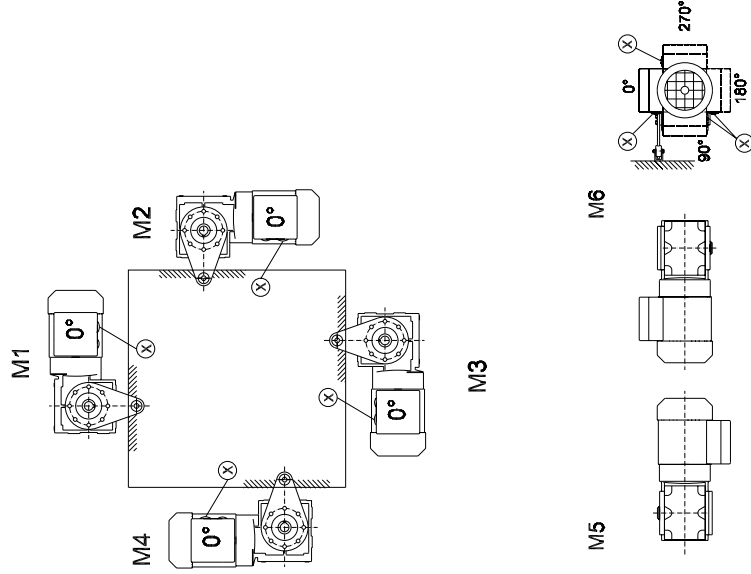
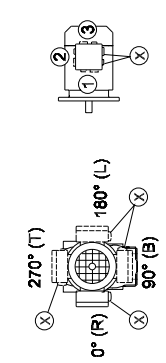
WF/WAF10-30

20 002 002



WA10-30

20 003 002





9 Lubricants

General information

Unless a special arrangement is made, SEW-EURODRIVE supplies the drives with a lubricant fill adapted for the specific gear unit and mounting position. The decisive factor is the mounting position (M1 ... M6, → Sec. "Mounting Positions and Important Order Information") specified when ordering the drive. You must adapt the lubricant fill to any subsequent changes made to the mounting position (→ Lubricant fill quantities).

9.1 Lubricant table

The lubricant table on the following page shows the permitted lubricants for SEW-EURODRIVE gear units. Please note the following key to the lubricant table.

Key to the lubricant table

Abbreviations used, meaning of shading and notes:

- CLP = Mineral oil
- CLP PG = Polyglycol (W gear units, conforms to USDA-H1)
- CLP HC = Synthetic hydrocarbons
- E = Ester oil (water pollution danger category WGK 1)
- HCE = Synthetic hydrocarbons + ester oil (USDA-H1 certification)
- HLP = Hydraulic oil
- = Synthetic lubricant (= synthetic anti-friction bearing grease)
- = Mineral lubricant (= mineral-based anti-friction bearing grease)
- 1) Helical-worm gear units with PG oil: Please contact SEW
- 2) Special lubricant for Spiroplan® gear units only
- 3) Recommendation: Select SEW f_g ≥ 1.2
- 4) Pay attention to critical starting behavior at low temperatures!
- 5) Low-viscosity grease
- 6) Ambient temperature
- Lubricant for the food industry (food grade oil)
- Biodegradable oil (lubricant for use in agriculture, forestry and water resources)



Anti-friction bearing greases

The anti-friction bearings in gear units and motors are given a factory-fill with the greases listed below. SEW-EURODRIVE recommends regreasing anti-friction bearings with a grease fill at the same time as changing the oil.

Anti-friction bearing in gear unit	Ambient temperature	Manufacturer	Type
Anti-friction bearing in motor	-20 °C ... +80 °C	Mobil	Mobilux EP 2
	-40 °C ... +80 °C	Mobil	Mobiltemp SHC 100
	-20 °C ... +80 °C	Esso	Unirex EQ3
	-20 °C ... +60 °C	Shell	Avantia RL3
	+80 °C ... +100 °C	Klüber	Barrierta L55/2
Special greases for anti-friction bearings in gear units:			
	-45 °C ... -25 °C	Shell	Aero Shell Grease 16
	-30 °C ... +40 °C	Aral	Eural Grease EP 2
	-20 °C ... +40 °C	Aral	Aralube BAB EP2



The following grease quantities are required:

- For fast-running bearings (motor and gear unit input end): Fill the cavities between the rolling elements one third full with grease.
- For slow-running bearings (in gear units and at gear unit output end): Fill the cavities between the rolling elements two thirds full with grease.



Lubricants

Lubricant fill quantities

Helical (RX) gear units

Gear unit type	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
RA...	0.60	0.80	1.30	1.30	0.90	0.90
RX57	0.80	0.80	1.70	1.90	1.10	1.10
RX67	0.80	1.50	2.60	2.70	1.60	1.60
RX77	1.70	2.50	4.80	4.80	2.90	2.90
RX87	2.10	3.40	7.4	7.0	4.80	4.80
RX97	3.90	5.6	11.6	11.9	7.7	7.7
RX107						
Gear unit type	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
RXE...	0.50	0.80	1.10	1.10	0.70	0.70
RXF57	0.70	0.80	1.50	1.40	1.00	1.00
RXF67	0.90	1.30	2.40	2.00	1.60	1.60
RXF77	1.60	1.95	4.90	3.95	2.90	2.90
RXF87	2.10	3.70	7.1	6.3	4.80	4.80
RXF107	3.10	5.7	11.2	9.3	7.2	7.2

Parallel shaft helical (F) gear units

F... FA..B, FH..B, FV..B:

Gear unit type	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
F..27	0.60	0.80	0.65	0.70	0.60	0.60
F..37	0.95	1.25	0.70	1.25	1.00	1.10
F..47	1.50	1.80	1.10	1.90	1.50	1.70
F..57	2.60	3.50	2.10	3.50	2.80	2.90
F..67	2.70	3.80	1.90	3.80	2.90	3.20
F..77	5.9	7.3	4.30	8.0	6.0	6.3
F..87	10.8	13.0	7.7	13.8	10.8	11.0
F..97	18.5	22.5	12.6	25.2	18.5	20.0
F..107	24.5	32.0	19.5	37.5	27.0	27.0
F..127	40.5	54.5	34.0	61.0	46.3	47.0
F..157	69.0	104.0	63.0	105.0	86.0	78.0

FF ..:

Gear unit type	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
FF27	0.60	0.80	0.65	0.70	0.60	0.60
FF37	1.00	1.25	0.70	1.30	1.00	1.10
FF47	1.60	1.85	1.10	1.90	1.50	1.70
FF57	2.80	3.50	2.10	3.70	2.90	3.00
FF67	2.70	3.80	1.90	3.80	2.90	3.20
FF77	5.9	7.3	4.30	8.1	6.0	6.3
FF87	10.8	13.2	7.8	14.1	11.0	11.2
FF97	19.0	22.5	12.6	25.6	18.9	20.5
FF107	25.5	32.0	19.5	36.5	27.5	28.0
FF127	41.5	55.5	34.0	63.0	46.3	49.0
FF157	72.0	105.0	64.0	106.0	87.0	79.0



Lubricants

Lubricant fill quantities

FA... FH... FV... FAF... FHF... FVF... FAZ... FHZ... FVZ...:

Gear unit type	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
F..27	0.60	0.80	0.65	0.70	0.60	0.60
F..37	0.95	1.25	0.70	1.25	1.00	1.10
F..47	1.50	1.80	1.10	1.90	1.50	1.70
F..57	2.70	3.50	2.10	3.40	2.90	3.00
F..67	2.70	3.80	1.90	3.80	2.90	3.20
F..77	5.9	7.3	4.30	8.0	6.0	6.3
F..87	10.8	13.0	7.7	13.8	10.8	11.0
F..97	18.5	22.5	12.6	25.2	18.5	20.0
F..107	24.5	32.0	19.5	37.5	27.0	27.0
F..127	39.0	54.5	34.0	61.0	45.0	46.5
F..157	68.0	103.0	62.0	104.0	85.0	77.0

Helical-bevel (K) gear units

K... KA..B, KH..B, KV..B:

Gear unit type	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
K..37	0.50	1.00	1.00	1.25	0.95	0.95
K..47	0.80	1.30	1.50	2.00	1.60	1.60
K..57	1.20	2.30	2.50	2.80	2.60	2.40
K..67	1.10	2.40	2.60	3.45	2.60	2.60
K..77	2.20	4.10	4.40	5.8	4.20	4.40
K..87	3.70	8.0	8.7	10.9	8.0	8.0
K..97	7.0	14.0	15.7	20.0	15.7	15.5
K..107	10.0	21.0	25.5	33.5	24.0	24.0
K..127	21.0	41.5	44.0	54.0	40.0	41.0
K..157	31.0	62.0	65.0	90.0	58.0	62.0
K..167	33.0	95.0	105.0	123.0	85.0	84.0
K..187	53.0	152.0	167.0	200	143.0	143.0

KF ..:

Gear unit type	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
KF37	0.50	1.10	1.10	1.50	1.00	1.00
KF47	0.80	1.30	1.70	2.20	1.60	1.60
KF57	1.30	2.30	2.70	3.15	2.90	2.70
KF67	1.10	2.40	2.80	3.70	2.70	2.70
KF77	2.10	4.10	4.40	5.9	4.50	4.50
KF87	3.70	8.2	9.0	11.9	8.4	8.4
KF97	7.0	14.7	17.3	21.5	15.7	16.5
KF107	10.0	21.8	25.8	35.1	25.2	25.2
KF127	21.0	41.5	46.0	55.0	41.0	41.0
KF157	31.0	66.0	69.0	92.0	62.0	62.0



KA..., KH..., KV..., KAF..., KHF..., KVF..., KAZ..., KHZ..., KVZ...:

Gear unit type	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
K.37	0.50	1.00	1.00	1.40	1.00	1.00
K.47	0.80	1.30	1.60	2.15	1.60	1.60
K.57	1.30	2.30	2.70	3.15	2.90	2.70
K.67	1.10	2.40	2.70	3.70	2.60	2.60
K.77	2.10	4.10	4.60	5.9	4.40	4.40
K.87	3.70	8.2	8.8	11.1	8.0	8.0
K.97	7.0	14.7	15.7	20.0	15.7	15.7
K.107	10.0	20.5	24.0	32.4	24.0	24.0
K.127	21.0	41.5	43.0	52.0	40.0	40.0
K.157	31.0	66.0	67.0	87.0	62.0	62.0
KH167	33.0	95.0	105.0	123.0	85.0	84.0
KH187	53.0	152.0	167.0	200	143.0	143.0

Spiroplan® (W)
gear units

The fill quantity of Spiroplan® gear units does not vary, irrespective of their mounting position:

Gear unit type	Fill quantity in liters, regardless of mounting position	
	W.10	0.16
W.20		0.26
W.30		0.50

Helical-worm (S)
gear units

S...:

Gear unit type	Fill quantity in liters					
	M1	M2	M3 ¹⁾	M4	M5	M6
S37	0.25	0.40	0.50	0.55	0.40	0.40
S47	0.35	0.80	0.70/0.90	1.00	0.80	0.80
S57	.50	1.20	1.00/1.20	1.45	1.30	1.30
S67	1.00	2.00	2.20/3.10	3.10	2.60	2.60
S77	1.90	4.20	3.70/5.4	5.9	4.40	4.40
S87	3.30	8.1	6.9/10.4	11.3	8.4	8.4
S97	6.8	15.0	13.4/18.0	21.8	17.0	17.0

1) The larger gear unit of multi-stage gear units must be filled with the larger oil volume.

SF...:

Gear unit type	Fill quantity in liters					
	M1	M2	M3 ¹⁾	M4	M5	M6
SF37	0.25	0.40	0.50	0.55	0.40	0.40
SF47	0.40	0.90	0.90/1.05	1.05	1.00	1.00
SF57	0.50	1.20	1.00/1.50	1.55	1.40	1.40
SF67	1.00	2.20	2.30/3.00	3.20	2.70	2.70
SF77	1.90	4.10	3.90/5.8	6.5	4.90	4.90
SF87	3.80	8.0	7.1/10.1	12.0	9.1	9.1
SF97	7.4	15.0	13.8/18.8	22.6	18.0	18.0

1) The larger gear unit of multi-stage gear units must be filled with the larger oil volume.



SA..., SH..., SAF..., SHF..., SAZ..., SHZ...:

Gear unit type	Fill quantity in liters					
	M1	M2	M3 ¹⁾	M4	M5	M6
S.37	0.25	0.40	0.50	0.50	0.40	0.40
S.47	0.40	0.80	0.70/0.90	1.00	0.80	0.80
S.57	0.50	1.10	1.00/1.50	1.50	1.20	1.20
S.67	1.00	2.00	1.80/2.60	2.90	2.50	2.50
S.77	1.80	3.90	3.60/5.0	5.8	4.50	4.50
S.87	3.80	7.4	6.0/8.7	10.8	8.0	8.0
S.97	7.0	14.0	11.4/16.0	20.5	15.7	15.7

1) The larger gear unit of multi-stage gear units must be filled with the larger oil volume.



10 Appendix

10.1 Index of changes

The following additions and changes have been made compared to the previous edition of the "Explosion-Proof Gear Units R..7, F..7, K..7, S..7, SPIROPLAN® W" (publication number: 1055520x, edition 11/2002) operating instructions:

General additions and corrections.

- Installing the gear unit: Data on flatness error
- Installing torque arms for mounted gear units: Data on retaining bolts
- Mounted gear units with shrink disks: Information on assembly / removal has been added
- Mounted gear units with TorqLOC®
- AM adapter coupling: Point A
- Lubricant change intervals

Inspection and maintenance

11 Index

- A**
- AD inspection / maintenance 47
 - AD, mounting on the input shaft assembly 40
 - Adapter coupling 36
 - Adjusting the mounting position 17
 - AM with backstop 38
 - Anti-friction bearing greases 75
 - AQ, installing the coupling adapter 38
 - AQA, maintenance / inspection 47
- B**
- Backstop RS 38
 - Breather valve 18
- C**
- Centering shoulder AD../ZR 41
 - Change the oil seal 47
 - Check oil 46
 - Check oil level 46
 - Churning bosses 51
 - Couplings, installation 20
 - Cover with backstop AD../RS 43
 - Cover with motor mounting platform AD../P 40
 - Customer service 48
- D**
- Damp locations 17
 - Designated use 6
- E**
- Extended storage 7
- F**
- F gear units, lubricant fill quantities 78
 - Flatness error 16
- G**
- Gear unit inspection 46
 - Gear unit maintenance 46
 - Gear unit structure 9
 - Gear unit venting 18
- H**
- Helical gear units, lubricant fill quantities 77, 78
 - helical gear units, structure 9
 - Helical-bevel gear units, lubricant fill quantities 79
 - Helical-bevel gear units, structure 11
 - Helical-worm gear unit, structure 12
 - Helical-worm gear units, lubricant fill quantities 80
- I**
- IEC adapter 36
- K**
- K gear units, lubricant fill quantities 79
 - Keyway 23
- L**
- Lubricant change intervals 45
 - Lubricant fill quantities 77
 - Lubricant fill quantities for helical gear units 77, 78
 - Lubricant fill quantities for helical-bevel gear units 79
 - Lubricant fill quantities for helical-worm gear units 80
 - Lubricant fill quantities for parallel shaft helical gear units 78
 - Lubricant fill quantities for Spiroplan® gear units 80
 - Lubricant table 74, 76
 - Lubricants 74
- M**
- Maintenance / inspection 47
 - Maintenance intervals 45
 - Maintenance of AD adapter 47
 - Maintenance of AM / AQA adapters 47
 - Malfunctions 48
 - AD input shaft assembly 49
 - AM / AQA / AL adapters 48
 - Gear units 48
 - Mechanical installation 15
 - Motor mounting platform 40
 - Mounted gear units 23, 27, 30
 - Mounting on the input shaft assembly AD 40
 - Mounting position designation 50
 - Mounting positions
 - Helical gear units 52, 55
 - Helical-bevel gear units 60
 - Helical-worm gear units 65
 - Parallel shaft helical gear units 57
 - Spiroplan® gear units 71
 - Mounting torque arms 21
- N**
- Nameplate 14
 - NEMA adapter 36
- Input and output elements, installation 19**
- Inspection intervals 45**
- Inspection of AD adapter 47**
- Inspection of AM / AQA adapters 47**
- Installation tolerances 15**
- Installing couplings 20**
- Installing input and output elements 19**
- Installing the AM coupling adapter 36**
- Installing the AQ coupling adapter 38**
- Installing the gear unit 16**



O	
Oil change	46
Open air	17
P	
Painting gear units	18
Parallel shaft helical gear unit, structure	10
Parallel shaft helical gear units, lubricant fill quantities	78
R	
R gear units, lubricant fill quantities	77
RS backstop	43
RX gear units, lubricant fill quantities	78
S	
S gear units, lubricant fill quantities	80
Safety notes	6
Serial number	14
Shrink disk	27
Solid shaft	19
Spiroplan® gear units, lubricant fill quantities	80
Spiroplan® W gear units, structure	13
Splined hollow shaft	23
Startup	44
<i>Helical, parallel shaft helical and helical-bevel gear units</i>	44
<i>Helical-worm and Spiroplan® W gear units</i>	44
Structure	
<i>Helical gear units</i>	9
<i>Helical-bevel gear units</i>	11
<i>Helical-worm gear unit</i>	12
<i>Parallel shaft helical gear unit</i>	10
<i>Spiroplan® gear units</i>	13
T	
TorqLOC®	30
Torque arm for helical-bevel gear units	21
Torque arm for helical-worm gear units	22
Torque arm for Spiroplan® W gear units	22
Torque arms for parallel shaft helical gear units	21
Torque arms, mounting	21
Transportation	7
U	
Unit designation	14
W	
W gear units, lubricant fill quantities	80
Waste disposal	5

4.14 REDUCER 305L3

Location	ECL Code	Reducer reference	Position
(x1) Turret rotation mechanism	1-10-034-64	305L3 53.4 FZP132 O	VA – Vertical

The following document is an extract of the supplier manual



Paragrafo Heading Abschnitt Paragraph		Pagina Page Seite Page	
Description	Beschreibung	Description	
1	Condizioni di fornitura	Conditions of supply	2
Trasporto	Transport	Transport	3
Stoccaggio	Storage	Storage	3
2	Norme per l'installazione	Instructions d'installation	4
Posizioni di montaggio	Mounting position	Position fonctionnement	4
Esecuzione riduttori Serie 300	300 Series gearbox mountings	Execution réducteurs Série 300	10
Esecuzione con flangia	Flange mounting	Execution avec bride	10
Esecuzione con albero femmina scanalato	Splined female shaft mounting	Execution avec arbre femelle cannelé	13
Esecuzioni con piedi di supporto	Foot mounting	Execution avec pattes de support	14
Versione pendolare	Shaft mounting design	Version montage flottant	15
3	Collegamenti	Liaisons	16
Collegamenti in entrata	Input couplings	Liaisons a l'entrée	18
Installazione motoriduttore	Installation of gearmotors	Installation motoreducteur	24
4	Lubrificazione	Lubrification	29
5	Messa in funzione	Mise en route	37
6	Manutenzione	Entretien	38

Revisions
Le edizioni dei cataloghi che subiscono revisioni, riportano al centro in basso delle pagine che hanno subito delle modifiche, il relativo ultimo indice di revisione. L'elenco delle pagine interessate alle relative revisioni è a pag.40. L'indice di revisione del catalogo è riportato nella IVa di copertina in basso al centro.

Änderungen
Der Änderungstatus ist auf jedem Blatt unten, in der Mitte enthalten. Auf Seite 40 ist eine Übersicht der berechtigten Seiten enthalten. Die Änderung des Katalogs ist auf der letzten, Seite des Einbands unten in der Mitte sichtbar.

Révisions
Les éditions des catalogues qui subissent des révisions, présentent au centre, du bas des pages, ayant subi des modifications, le dernier indice de révision. La liste des pages concernées par les révisions se trouve page 40. L'indice de révision du catalogue se trouve à la IVème page de couverture en bas au centre.

Il Gruppo Bonfiglioli, sensibile al problema dell'ambiente e all'ecologia, ha realizzato le pagine di questo catalogo in carta riciclata.

Die Gruppe Bonfiglioli, denkend umweltschonend, hat den Katalog auf Altpapier gedruckt.

Le Groupe Bonfiglioli, sensible aux problèmes de préservation de l'environnement, a imprimé ce catalogue sur du papier recyclé.

1 - CONDIZIONI DI FORNITURA
1 - SUPPLY CONDITIONS
1 - LIEFERBEDINGUNGEN
1 - CONDITIONS DE LIVRAISON

I riduttori vengono forniti come segue:
Gearboxes are supplied as follows:
Die Getriebe werden folgendermaßen geliefert:
Les réducteurs sont livrés comme suit:

a) già predisposti per essere installati nella posizione di montaggio come definito in fase di ordine;
a) ready for installation in the mounting position specified on order;
a) bereits für die Installation in der Einbaulage gemäß Auftrag bereit;

b) senza olio lubrificante ed internamente protetti con un film d'olio usato per il collaudo finale (tipo SHELL ENSIS OIL N);
b) dry; inner parts are protected by a film of the oil used for final testing (type SHELL ENSIS OIL N);
b) ohne Schmieröl und innen mit einem Öl, das für die Endabnahmeprüfung verwendet wurde, überzogen (Typ SHELL ENSIS OIL N);
b) sans huile lubrifiante et protégés à l'intérieur avec un film d'huile utilisée lors de l'essai final (type SHELL ENSIS OIL N);

c) verniciati con vernice di fondo antiossidante all'acqua di colore grigio (tipo Idrayon Primer-Ral 7042/C441). Le superfici di accoppiamento non sono verniciate. La verniciatura finale è a cura del cliente;
c) painted with antioxidant water primer in the colour grey (type Idrayon Primer-Ral 7042/C441). Mating surfaces are not painted. Final coat is to be applied by the Customer;
c) mit einer grauen, vor Oxidation durch Wasser schützenden Grundlackierung überzogen (Typ Idrayon Primer-Ral 7042/C441). Die Verbindungsflächen sind nicht lackiert. Die Endlackierung geht zu Lasten des Kunden;

d) collaudati secondo specifiche interne;
d) tested to in-house specifications;
d) gemäß werksinterner Spezifikationen geprüft;

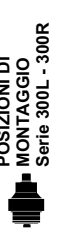
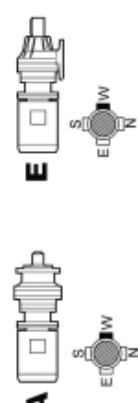
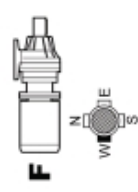
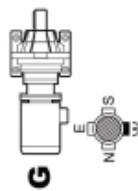
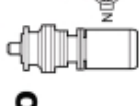
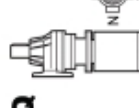
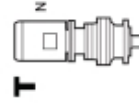

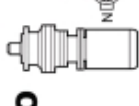
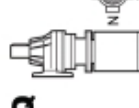
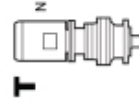

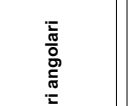
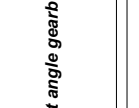
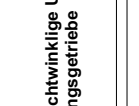
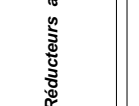
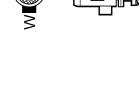



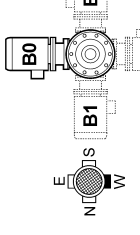
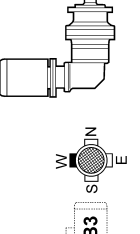
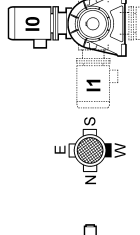
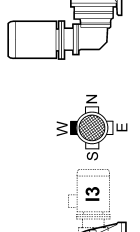




e) appositamente imballati;
e) suitably packed;
e) in angemessener Weise verpackt;

f) provvisti di dadi e bulloni per montaggio motori elettrici versione IEC;
f) complete with mounting nuts and bolts for IEC electric motors;
f) mit Muttern und Schrauben für die Montage an Elektromotoren der Version IEC;

g) già provvisti di lubrificante per quelli a lubrificazione permanente.
g) life-lubed gearboxes are factory filled with oil.
g) déjà pourvus de lubrifiant pour ceux à lubrification permanente.

d) essayés d'après les spécifications internes;
e) dûment emballés;
f) pourvus d'écrous et de boulons pour l'assemblage aux moteurs électriques, version CEI;
g) déjà pourvus de lubrifiant permanent.



TRASPORTO	SHIPMENT	TRANSPORT	TRANSPORT
<p>Durante il trasporto è normale trattare i riduttori come merce delicata per evitare danni. Durante i trasporti interni dei riduttori sbalati, evitare che questi prendano urti per non danneggiare parti esterne delicate.</p>	<p>Always handle gearboxes as fragile goods during shipment. When moving unpacked gearboxes inside your factory, ensure that they are not subjected to impacts which could damage delicate external components and surfaces.</p>	<p>Während dem Transport empfindet es sich, die Getriebe mit Sorgfalt und Vorsicht zu behandeln, um Schäden zu vermeiden. Beim verpackten Transport der schon ausgepackten Getriebe sollte vermieden werden, dass diese Schläge oder Stöße erleiden, welche empfindliche äussere Teile beschädigen könnten.</p>	<p>Durant le transport, il est nécessaire de traiter les réducteurs comme des produits délicats, afin d'éviter tout dommage. Durant les transports internes des réducteurs déballés, éviter que ces derniers ne subissent des chocs pour ne pas endommager les parties externes sensibles.</p>
STOCCAGGIO	STORAGE	LAGERUNG	STOCKAGE
<p>Il corretto stoccaggio dei prodotti ricevuti richiede l'esecuzione delle seguenti attività:</p> <ol style="list-style-type: none"> Escludere aree all'aperto, zone esposte alle intemperie o con eccessiva umidità; Interporre sempre tra il pavimento ed i prodotti, piani lignei o di altra natura, atti ad impedire il diretto contatto col suolo; Per periodi di stoccaggio superiori ai 60 giorni, le superfici interessate agli accoppiamenti quali flange, alberi e giunti, devono essere protette con idoneo prodotto antiossidante (SHELL ENSIS FLUID SDC od equivalente); Per previsti superiori ai 6 mesi, i prodotti devono essere oggetto delle seguenti attività: <ol style="list-style-type: none"> Ricoprire le parti lavorate esterne e quelle di accoppiamento con grasso atto ad evitare ossidazioni; Posizionare i riduttori con il tappo di sfato nella posizione più alta e riempirli di olio ad eccezione di quelli con lubrificazione permanente. I riduttori, prima del loro utilizzo, dovranno essere riempiti con la corretta quantità e tipo di lubrificante previsto (vedi pag.35-36) 	<p>Observe the following instructions to ensure correct storage of delivered products:</p> <ol style="list-style-type: none"> Do not store outdoors, in areas exposed to weather or with excessive humidity; Always place boards in between floor and products, to avoid direct contact with the floor; For storage periods of over 60 days, all machined surfaces such as flanges, shafts and couplings must be protected with a suitable antioxidant product (SHELL ENSIS FLUID SDC or equivalent product); The following measures must be taken in respect of products for which the expected storage period exceeds 6 months: <ol style="list-style-type: none"> Cover outer machined parts and mating parts with grease to avoid oxidation; Position the gearboxes with the breather plug up and fill them with oil (this does not apply to life-lubed gearboxes). Before use, the gearboxes should be filled with the proper amount of lubricant of the recommended type (page 35-36). 	<p>Die korrekte Lagerung der Antriebe erfordert folgende Vorkehrungen:</p> <ol style="list-style-type: none"> Die Produkte nicht im Freien lagern und nicht in Räumen, die der Witterung ausgesetzt sind, oder eine hohe Feuchtigkeit aufweisen; Die Produkte nie direkt auf dem Boden, sondern auf Unterlagen aus Holz oder einem anderen Material lagern; Bei Lagerzeiten von mehr als 60 Tagen die Oberflächen für die Verbindung, wie Flansche, Wellen oder Kupplungen mit einem geeigneten Oxidationsschutzmittel behandeln (SHELL ENSIS FLUID SDC oder ein äquivalentes Mittel); Bei Lagerzeiten von mehr als 6 Monaten müssen folgende Vorkehrungen getroffen werden: <ol style="list-style-type: none"> Die bearbeiteten Außenstellen und die Passflächen mit Oxidationsschutzfett abdichten; Die Getriebe mit der Entlüftungsschraube in der obersten Position ausgerichtet aufstellen und, die mit Dauerschmierung ausgestatteten Getriebe ausgenommen, mit Öl füllen. Die Getriebe müssen vor ihrem Einsatz mit der richtigen Menge des vorgesehenen Schmiermittels aufgefüllt werden (Seite 35-36). 	<p>Un stockage correct des produits reçus nécessite de respecter les règles suivantes:</p> <ol style="list-style-type: none"> Exclure les zones à ciel ouvert, les zones exposées aux intempéries ou avec humidité excessive; Interposer dans tous les cas entre le plancher et les produits des planches de bois ou des supports d'autre nature empêchant le contact direct avec le sol; Pour les périodes de stockage supérieures à 60 jours, les surfaces concernées par les liaisons telles que les brides, les arbres et les accouplements doivent être protégées avec un produit antioxydant spécial (SHELL ENSIS FLUID SDC ou équivalent); Pour les périodes de stockage prévues supérieures à 6 mois, les produits doivent être objet des contrôles suivants: <ol style="list-style-type: none"> Recouvrir les parties extérieures usinées et les éléments d'accouplement avec de la graisse contre l'oxydation; Positionner les réducteurs avec le bouchon reniflard le plus haut possible et les remplir d'huile, à l'exception de ceux à lubrification permanente. Avant utilisation, les réducteurs doivent être remplis de la quantité et du type de lubrifiant préconisés (page 35-36).
2 - NORME PER L'INSTALLAZIONE	2 - INSTALLATION	2 - INSTALLATION	2 - INSTRUCTIONS D'INSTALLATION
<p>Prima dell'installazione controllare che questo sia nella esecuzione prevista per la posizione di montaggio.</p>	<p>Check that the gearbox is the right model and type before starting installation.</p>	<p>Vor Installation des Getriebes kontrollieren, daß die gefertigte Ausführung für die gewünschte Einbaulage vorgesehen ist.</p>	<p>Avant installation du réducteur s'assurer que celui-ci soit prévu pour sa position de montage.</p>
POSIZIONI DI MONTAGGIO Serie 300L - 300R	MOUNTING POSITION 300L - 300R Series	MONTAGEPOSITIONEN Serie 300L - 300R	POSITION DE FONCTIONNEMENT Série 300L - 300R
			
Riduttori in linea	Inline gearboxes	Coassiale	Réducteurs coaxiaux
			
			
Riduttori angolari	Right angle gearboxes	Rechtwinklige Untersetzungsgetriebe	Réducteurs a rénvai d'angle
			
			
B0 - B1 - B2 - B3	B0 - B1 - B2 - B3	B0 - B1 - B2 - B3	B0 - B1 - B2 - B3
			
			
B0 - B1 - B2 - B3	B0 - B1 - B2 - B3	B0 - B1 - B2 - B3	B0 - B1 - B2 - B3

POSIZIONI DI MONTAGGIO Serie 300L - 300R

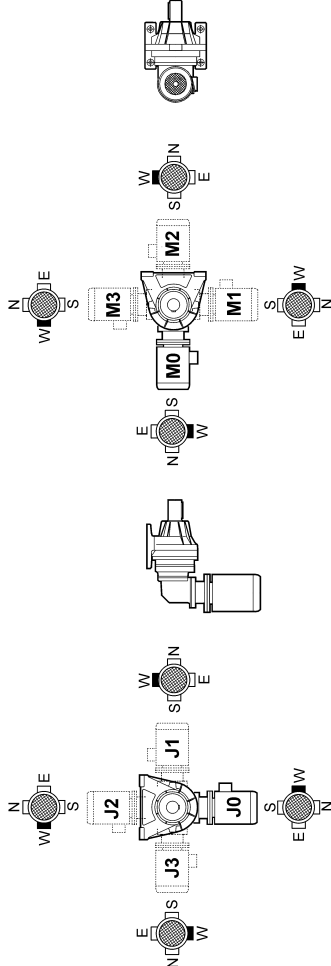
MONTAGEPOSITIONEN Serie 300L - 300R

POSITION DE FONCTIONNEMENT Série 300L - 300R

(FIG. 3)

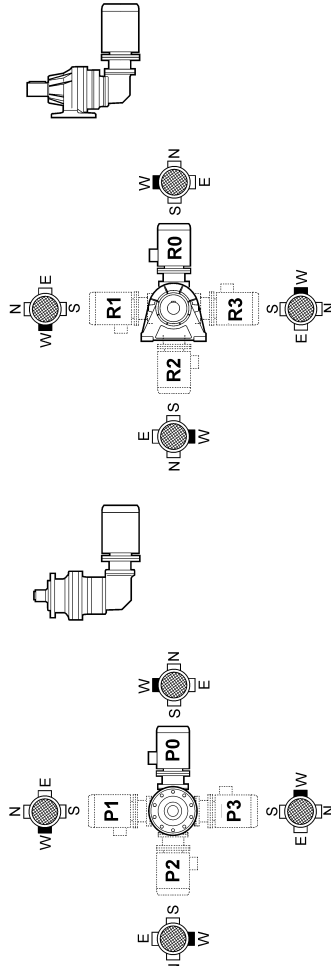
J0 - J1 - J2 - J3

M0 - M1 - M2 - M3



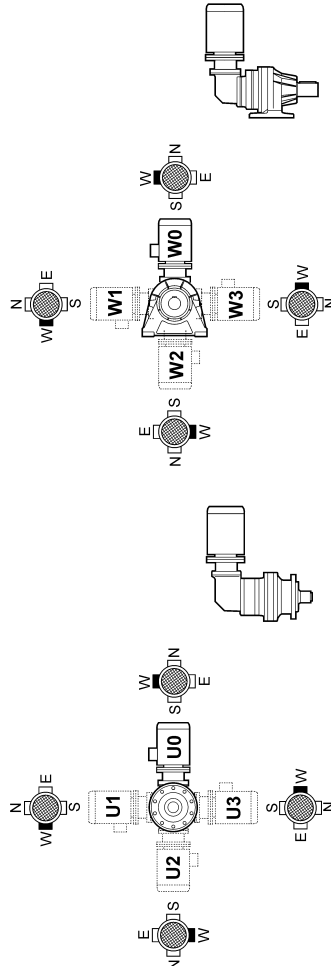
P0 - P1 - P2 - P3

R0 - R1 - R2 - R3



U0 - U1 - U2 - U3

W0 - W1 - W2 - W3



POSIZIONI DI MONTAGGIO Serie 3/VF

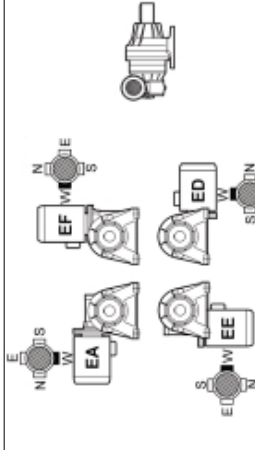
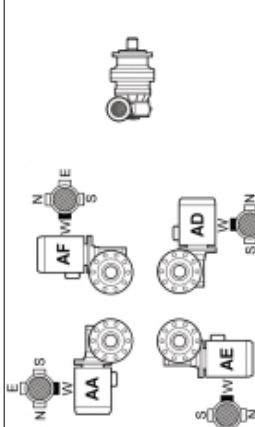
MOUNTING POSITION 3/VF Series

MONTAGEPOSITIONEN Série 3/VF

(FIG. 4)

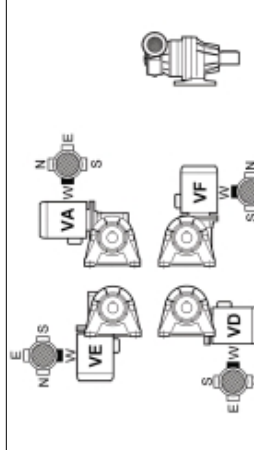
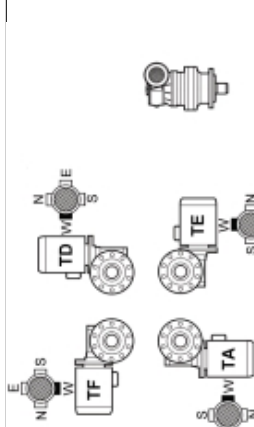
AA - AE - AF - AD

EA - EE - EF - ED



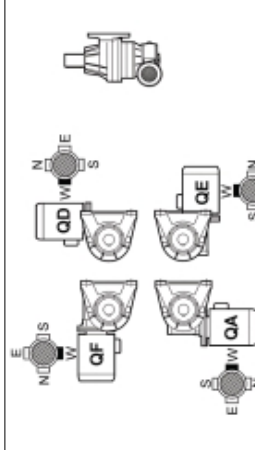
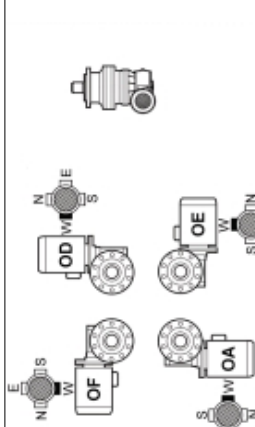
TA - TE - TF - TD

VA - VE - VF - VD

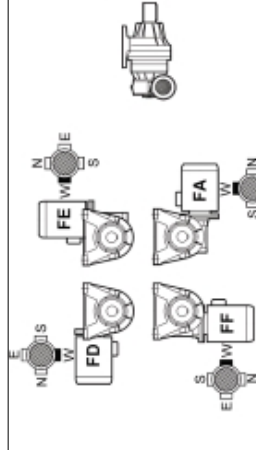


OA - OE - OF - OD

QA - QE - QF - QD



FA - FE - FF - FD

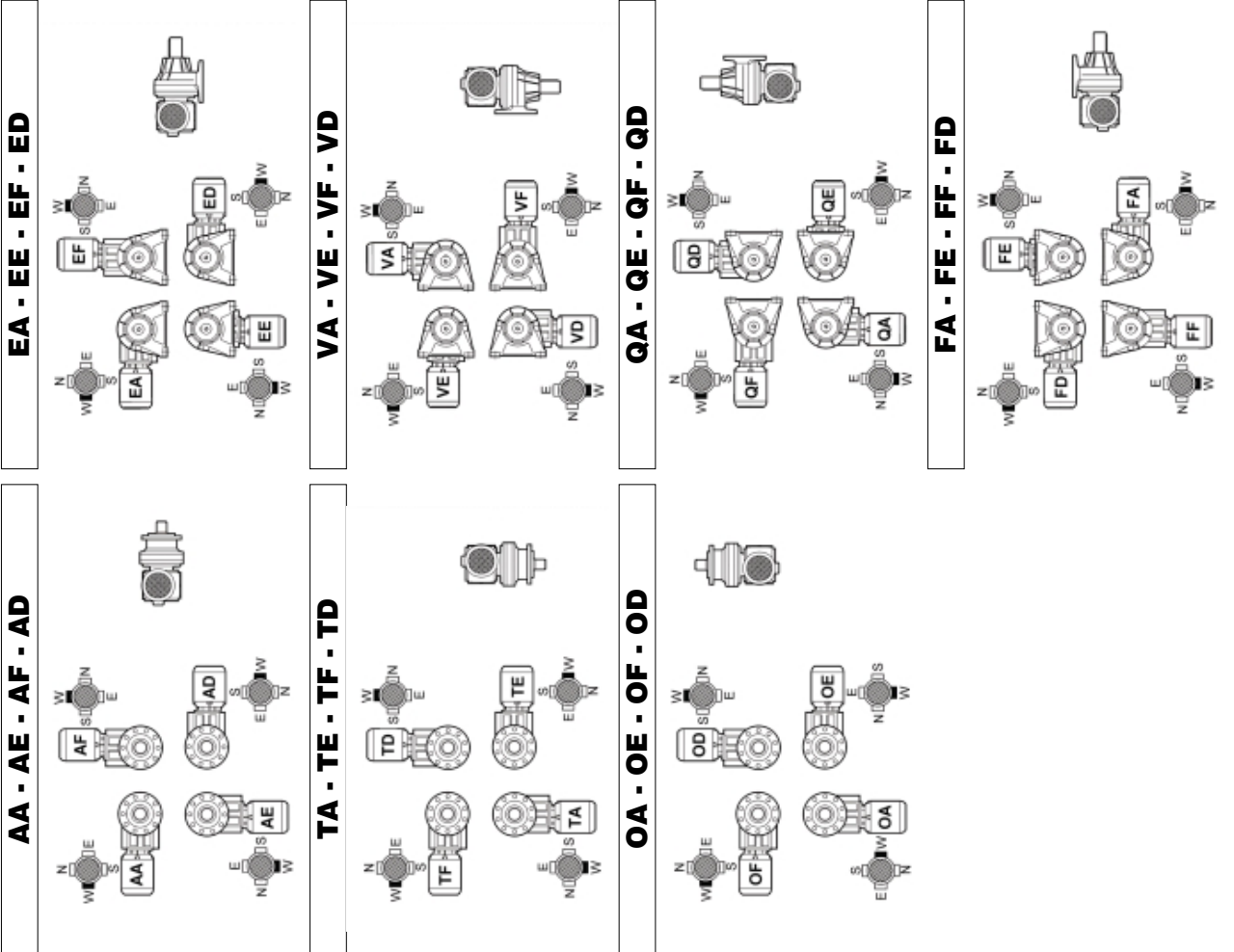


POSIZIONI DI MONTAGGIO Serie 3/A (FIG. 5)

MOUNTING POSITION 3/A Series

MONTAGEPOSITIONEN Serie 3/A

POSITION DE FONCTIONNEMENT Série 3/A



FORME COSTRUTTIVE

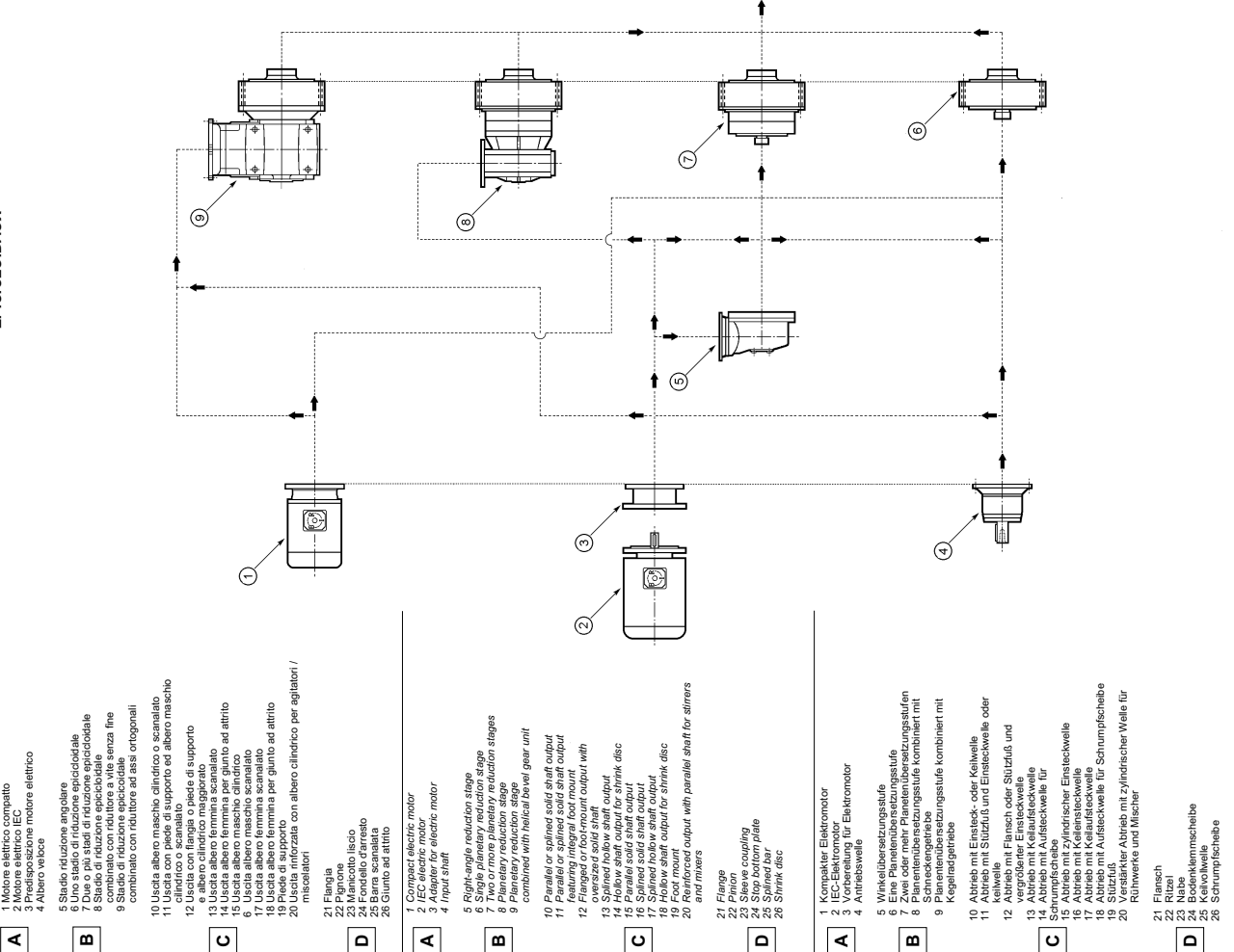
VERSIONS

BAUFORMEN

FORMES DE CONSTRUCTION

A ENTRATE / INPUT ANTRIEB / ENTREES

B RIDUZIONI / REDUCTIONS UNTERSETZUNGEN / TRANS EPICYCLOIDaux

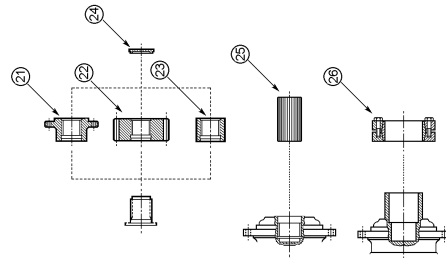
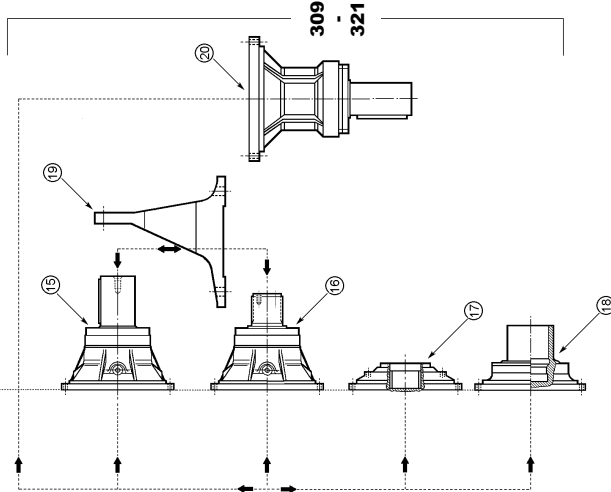
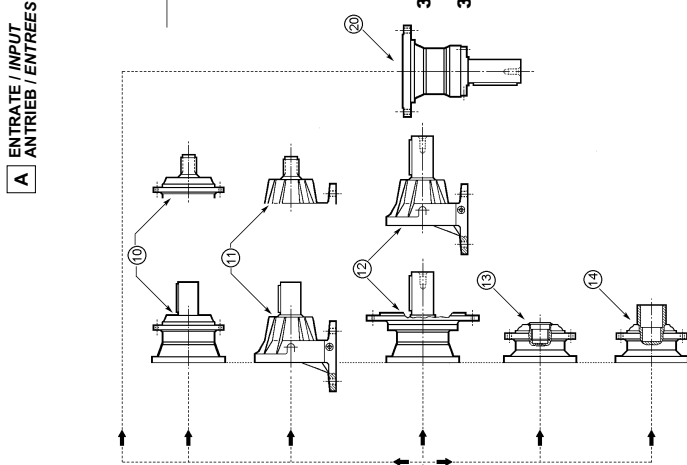


**FORME
COSTRUTTIVE**

VERSIONS

BAUFORMEN

FORMES DE CONSTRUCTION



- | | | | |
|---|---|----|---|
| 1 | Moteur électrique compact | 10 | Sortie arbre à mâle cylindrique ou cannelé |
| 2 | Moteur électrique classique | 11 | Sortie arbre à mâle cylindrique ou cannelé |
| 3 | Prédisposition moteur à électrique | 12 | Sortie avec bride ou patte de support et arbre cylindrique ou cannelé |
| 4 | Arbre simple | 13 | Cylindrique majoré |
| 5 | Etage de réduction angulaire | 14 | Sortie arbre à mâle joint à frottement |
| 6 | Un étage de réduction épicycloïdal | 15 | Sortie arbre à mâle cylindrique |
| 7 | Deux ou plusieurs étages de réduction | 16 | Sortie arbre à mâle cannelé |
| 8 | Etage de réduction épicycloïdal combiné | 17 | Sortie arbre à mâle joint à frottement |
| 9 | Avec réducteur à vis sans fin | 18 | Sortie arbre à mâle joint à frottement |
| | | 19 | Patte de support |
| | | 20 | Sortie arbre cylindrique pour agitateurs et mélangeurs |
| | | 21 | Bride |
| | | 22 | Manchon |
| | | 23 | Manchon lisse |
| | | 24 | Fond de butée |
| | | 25 | Joint à frottement |

**ESECUZIONE
SERIE 300**

300 SERIES GEARBOX MOUNTINGS

**AUSFÜHRUNG GETRIEBE
SERIE 300**

**EXECUTION REDUCTEURS
SERIE 300**

- ESECUZIONE CON FLANGIA
- ESECUZIONE CON PIEDE
- ESECUZIONE PENDOLARE

ESECUZIONE CON FLANGIA

FLANGE MOUNTING

Ricavare, sulla macchina o impianto su cui vengono installati, le contreflange di accoppiamento. Queste dovranno avere la superficie di accoppiamento con la flangia del riduttore piana e lavorata di macchina utensile. Collegare l'albero d'uscita all'organo da comandare secondo le indicazioni.

AUSFÜHRUNG MIT FLANSCH

Die entsprechenden Gegenflansche an der Maschine oder Anlage, an der das Getriebe eingebaut werden soll, vorbereiten.

Die Kontaktf lächen mit dem Getriebeflansch müssen perfekt eben und mit Werkzeugmaschinen bearbeitet sein.

Die Abtriebswelle, den auf den nachstehenden Zeich-

EXECUTION AVEC BRIDE

Repérer les contre-bridés de couplage sur la machine ou l'installation existante. Celles-ci devront avoir une surface de couplage avec la bride du réducteur plane et usinée.

Reller l'arbre de sortie à l'organe qui doit être commandé suivant les indications sur les plans (Figure 8) et (Figure 9).

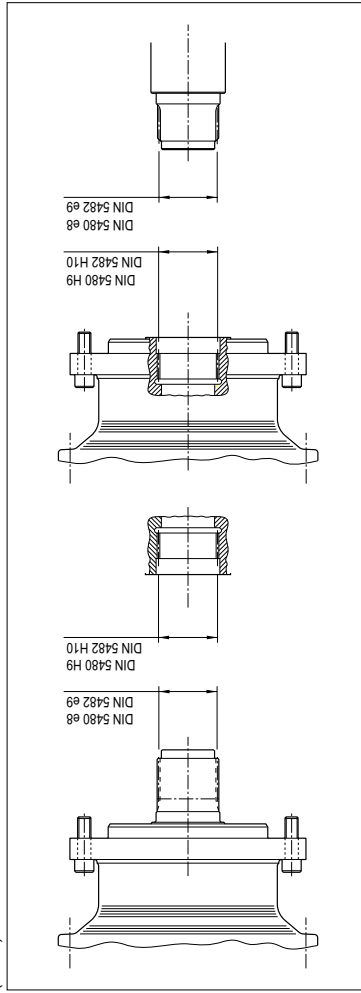
to ensure correct centering of the gearboxes:

Pour les centrages, respecter les indications suivantes:

GRANDEZZE FINO AL 307: *SIZES UP TO 307: Refer to drawing (FIG.10) for solid shaft coupling.*

GRÖSSEN BIS 307:
Version mit Innenwe-
Zeichnung (Abb.10)

GRANDEURS JUSQU'À 307:
exécution avec arbre male: se
référer au plan (Figure 10)

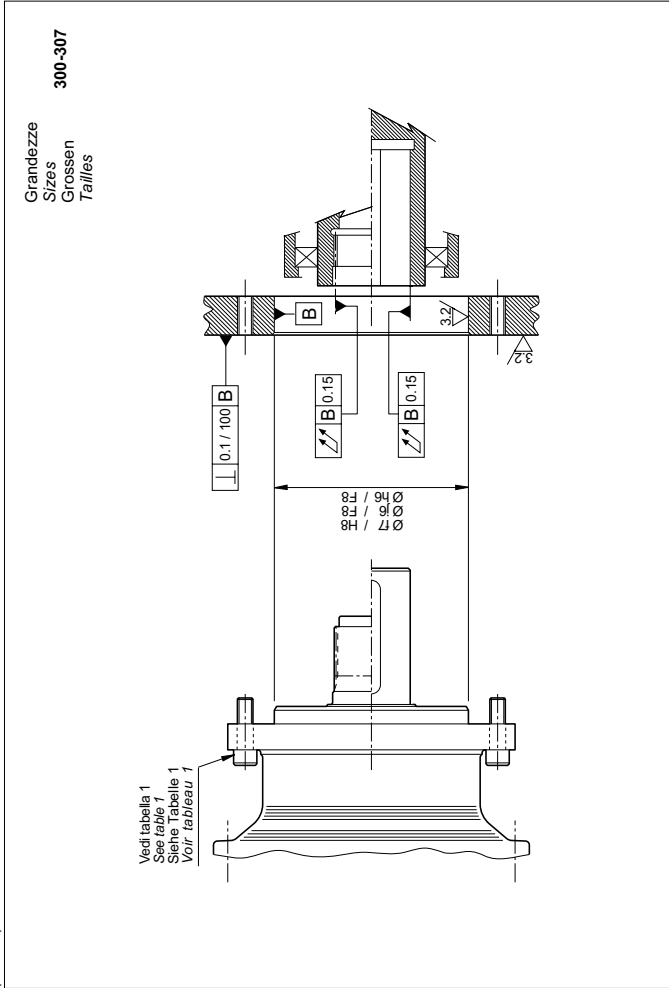


(FIG. 9)

Tolleranze consigliate / Recommended tolerances
Empfohlene Toleranzen / Tolérances admises

Accoppiamento libero <i>Loose coupling</i> Freie Passung <i>Accouplement libre</i>	Accoppiamento con interferenza <i>Coupling with interference</i> Passung mit Interferenz <i>Accouplement avec interference</i>
Albero pieno Solid shaft Vollwelle <i>Arbre plein</i>	Albero cavo Hollow shaft Hohlwelle <i>Arbre creux</i>
Ø d h6	Ø d h6
Ø d k6	Ø d k6
Ø d m6	Ø d m6
Ø D F7	Ø D F7
Ø D E7	Ø D K7
Ø d r6	Ø d r6
	Ø D H7

(FIG. 10)



GRANDEZZE DAL 309
IN POI CON USCITA
ALBERO MASCHIO

Questi riduttori sono provvisti di due diametri di centraggio. Per le flange di accoppiamento è sufficiente un solo centraggio quando sull'albero in uscita non vi sono carichi radiali o comunque questi sono inferiori al 60% dei carichi ammessi.

Per carichi superiori prevedere la flangia di accoppiamento con tutti e due i diametri di centraggio. Nel caso in cui il riduttore debba trasmettere coppie elevate con urti ed inversioni del senso di rotazione occorre eseguire sulla controflangia fori per le spine.

Al momento della installazione fare avanzare nella controflangia le spine già montate sul riduttore di una misura pari al loro diametro.

Vedi disegno (FIG. 11).

SIZES FROM 309
UPWARDS, WITH MALE
OUTPUT SHAFT

These gearboxes have two alignment rings of different diameter. If the output shaft is not subject to radial load, or if radial load is below 60% maximum allowable, only one alignment ring needs to be fitted to the counter-flange. For higher loads, the counter-flange must hold both rings firmly. If the gearbox has to transmit high torque or is subjected to loads with impact or direction changes, dowel holes must also be drilled in the counter-flange.

The dowels provided on the gearbox flanges should enter the holes in the counter-flanges by a length equivalent to their diameter.

See drawing (FIG. 11).

GRÖSSEN VON 309
AUFWÄRTS MIT EINFÜHR-
WELLE

Diese Getriebe sind mit zwei Zentrierdurchmessern ausgestattet. Für die Verbindungsfleisch genügt eine einzige Zentrierung, wenn an der Abtriebswelle keine Radialbelastungen vorliegen oder wenn sie weniger als 60% der zulässigen Belastungen betragen. Für höhere Belastungen den Verbindungsfleisch mit beiden Zentrierdurchmessern vorzubereiten.

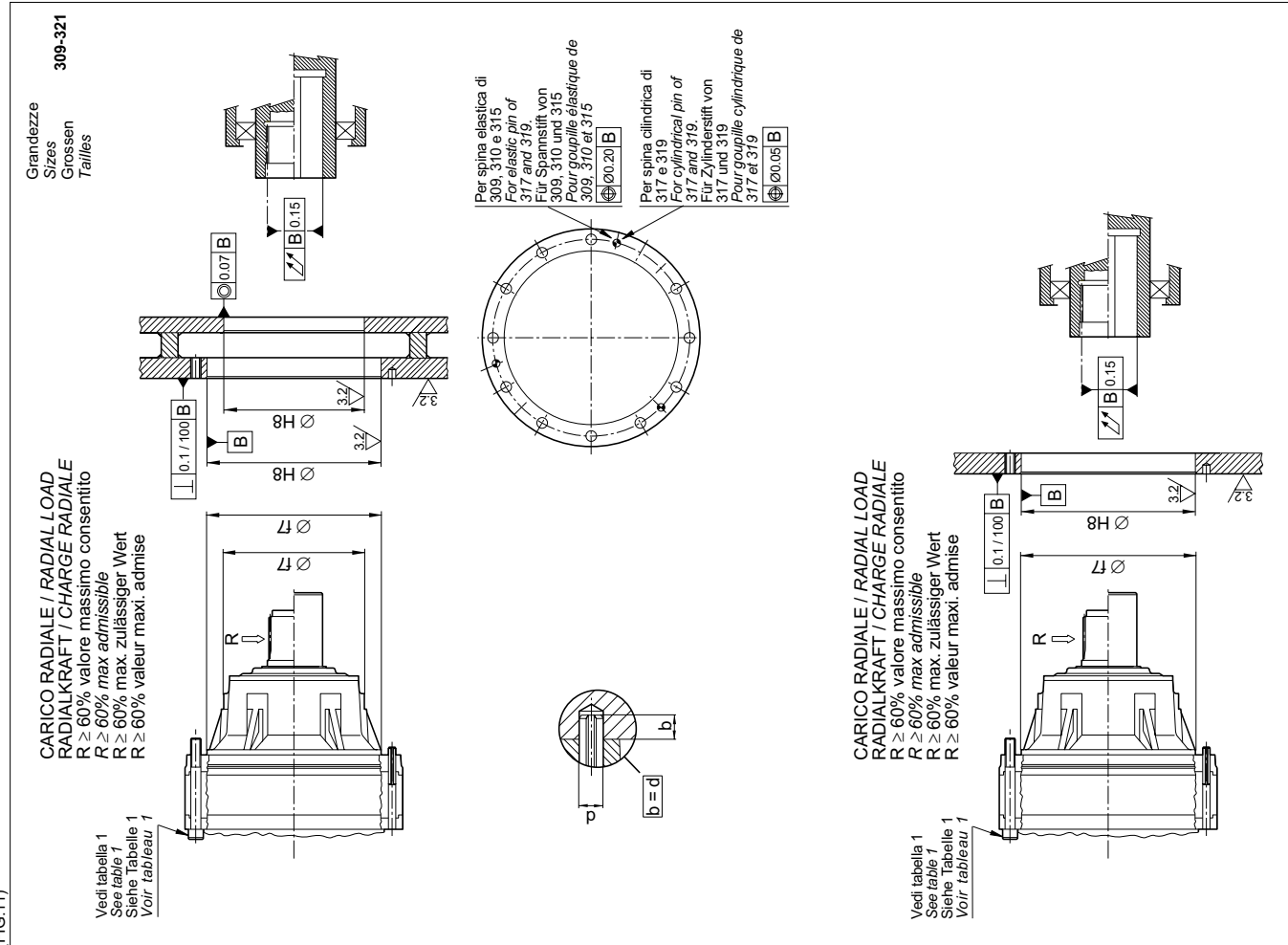
Falls das Getriebe hohe Drehmomente übertragen muss, mit Schlägen und Umkehrungen der Drehrichtung, sollten auf dem Gegenflansch Bohrungen für Stift angebracht werden. Bei der Installation die am Getriebe schon angebrachten Stift um ein Mass in den Gegenflansch einführen, das ihrem Durchmesser entspricht. Siehe Zeichnung (Abb. 11).

TAILLES 309 ET AU-DELA,
AVEC ARBRE DE SORTIE
MÂLE

Ces réducteurs sont prévus avec deux diamètres de centrage. Pour les brides de fixation, un seul centrage est suffisant, quand l'arbre de sortie n'est soumis à aucune charge radiale, ou lorsque celle-ci est inférieure à 60% de la valeur des charges maximum admissibles.

Pour des charges supérieures, il est nécessaire de prévoir la bride de fixation avec les deux diamètres de centrage. Lorsque le réducteur est soumis à des couples élevés avec chocs, et inversions du sens de rotation, il est nécessaire d'effectuer, sur la bride de fixation, des trous pour recevoir des goupilles. Au moment de l'installation, faire avancer, dans la bride recevant le réducteur, les goupilles déjà montées, d'une longueur équivalente à leur diamètre. Voir plan (Figure 11).

(FIG. 11)



ESECUZIONE CON
ALBERO FEMMINA
SCANALATO

SPLINED FEMALE SHAFT
MOUNTING

AUSFÜHRUNG MIT
NUTAUFNAHMEWELLE

EXECUTION AVEC ARBRE
FEMELLE CANNELÉ

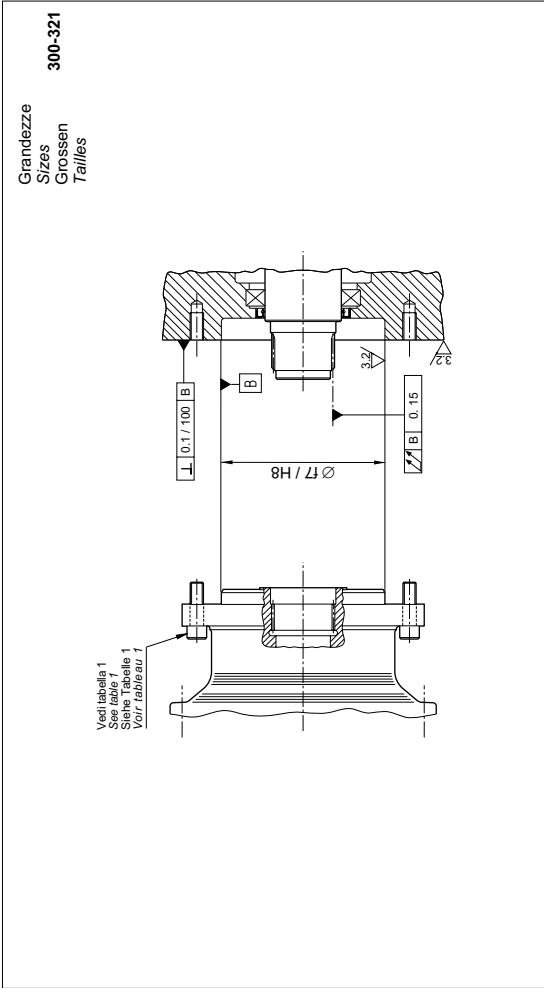
Assicurare l'allineamento fra riduttore e albero condotto e che quest'ultimo non subisca flessioni durante l'esercizio. Vedi disegno (FIG.12).

Make sure that the gearbox is perfectly aligned with the driven shaft, and also check that the driven shaft is not subject to flexure during rotation. See drawing (FIG.12).

Die Flucht zwischen Getriebe und Abtriebswelle herstellen und sicherstellen, dass letztere während dem Betrieb keinen Biegungen ausgesetzt ist. Siehe Zeichnung (Abb.12).

S'assurer de l'alignement entre le réducteur et l'arbre entraîné, et vérifier que ce dernier ne subisse aucune flexion durant le fonctionnement. Voir plan (Figure 12).

(FIG. 12)



Grandezze
Sizes
Grossen
Tailles

300-321

VITI DI FISSAGGIO RIDUTTORI FLANGIATI

FIXING SCREWS OF FLANGE MOUNTING

BEFESTIGUNGSSCHRAUBEN VON GETRIEBEN MIT FLANSCHSCHAUFÜHRUNG

VIS DE FIXATION REDUCTEURS A BRIDE

Vite/Screws/Schrauben/Vits	300	310	311	313	315	317	319	321
Quantità/Quantity/Menge/Quantité	M10	M16	M16	M20	M20	M30	M30	M30
Classe/Class/Klasse/Classe	8	8.8	8.8	8.8	8.8	8.8	8.8	8.8
Coppia di serraggio/Tightening torque Anzugsmoment/Couple de serrage	50	85	85	85	85	135	200	200

Vite/Screws/Schrauben/Vits	309	310	311	313	315	317	319	321
Quantità/Quantity/Menge/Quantité	M12	M15	M24	M30	M30	M30	M30	M30
Classe/Class/Klasse/Classe	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8
Coppia di serraggio/Tightening torque Anzugsmoment/Couple de serrage	200	200	200	400	400	1400	1400	1400

Per coppie massime trasmesse maggiori o uguali al 70% della coppia con M_{2max} indicata e con frequenti inversioni del moto, utilizzare viti in classe minima di resistenza 10.9.

With transmitted output torque greater than or equal to 70% of the indicated M_{2max} torque, and with frequent movement reversals, use screws with minimum resistance 10.9.

Für zu übertragene Maximaldrehmomente, die höher als 70% des angegebenen Werts M_{2max} oder diesem Prozentsatz gleich kommen und im Fall von häufigen Schaltungen sind Schrauben aus der Klasse der min. Widerstandsgrade 10.9 zu verwenden.

Pour des couples maximaux transmis plus importants ou équivalents à 70% du couple M_{2max} indiqué, et en cas d'inversions fréquentes du mouvement, utiliser des vis dans une classe minimale de résistance 10.9.

ESECUZIONE CON PIEDI DI SUPPORTO

FOOT MOUNTING

AUSFÜHRUNG MIT STANDFÜSSEN

EXECUTION AVEC CARTER A PATTES

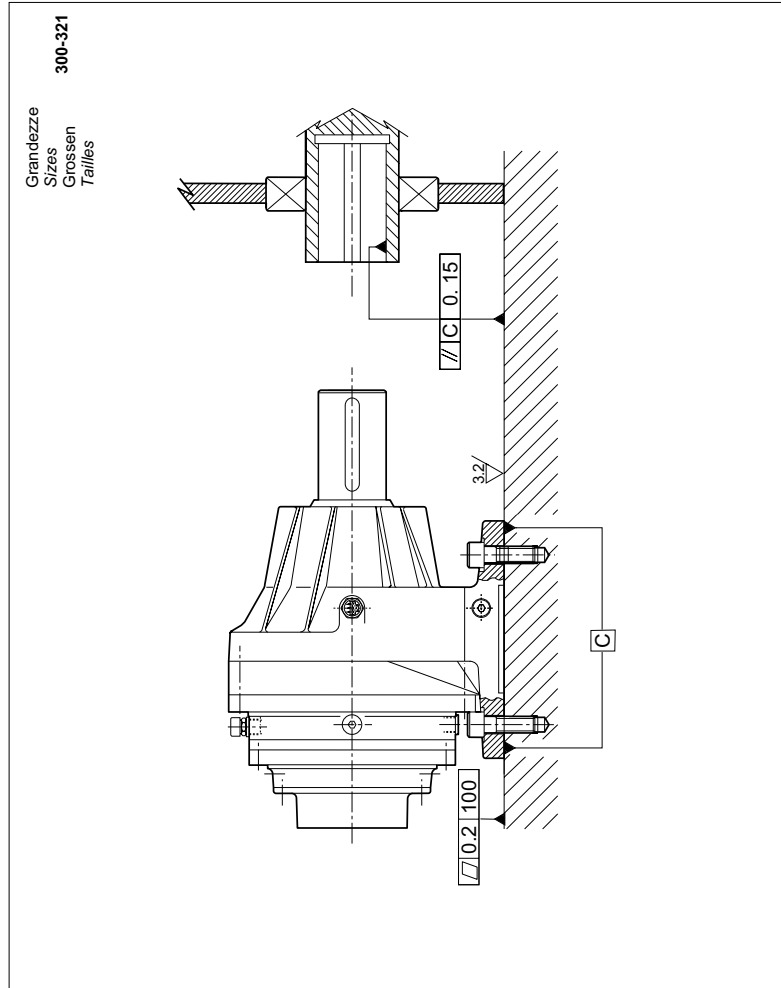
Il fissaggio di questi riduttori deve avvenire su una base sufficientemente rigida, lavorata da macchina utensile con un errore massimo di planarità non superiore a 0.2 mm/100mm. Vedi disegno (FIG.13).

Make sure that the mounting base is sufficiently rigid. Bases must be machined to a maximum flatness tolerance of 0.2mm/100mm. See drawing (FIG.13).

Diese Getriebe sollten auf einer ausreichend starren und mit Werkzeugmaschinen bearbeiteten Grundlage befestigt werden, wobei der maximal zulässige Ebenheitsfehler nicht grösser als 0.2 mm/100 mm sein darf. Siehe Zeichnung (Abb.13).

La fixation de ces réducteurs doit s'effectuer sur un châssis suffisamment rigide, usiné sur machine-outil avec une erreur maximum de planéité ne dépassant pas 0.2 mm/100 mm. Voir plan (Figure 13).

(FIG. 13)



Grandezze
Sizes
Grossen
Tailles

300-321

VERSIONE PENDOLARE

SHAFT MOUNTING DESIGN

AUFSTECKMONTAGE

VERSION MONTAGE
FLOTTANT

Fissare il braccio di reazione con viti classe minima di resistenza 8,8 serrate ad una coppia corrispondente al 70% della loro carica di snervamento. Pulire e sgrassare le superfici degli alberi di accoppiamento sia interna del riduttore che quella esterna dell'albero da accoppiare.

Montare il giunto sull'albero del riduttore dopo aver leggermente lubrificato la sua superficie esterna. Serrare leggermente un primo gruppo di 3 viti, posizionando secondo i vertici di un triangolo equilatero (esempio: le viti pos. 1-5-9 del disegno FIG.15). Accoppiare il riduttore sull'albero da azionare.

Serrare le viti gradualmente (secondo lo schema del triangolo equilatero) procedendo in senso circolare, effettuando più passaggi affinché tutte le viti siano serrate alla coppia specificata in tabella 2, a seconda del tipo di giunto/riduttore.

Vedi disegno (FIG.14)

N.B. : non serrare in sequenza viti diametralmente opposte.

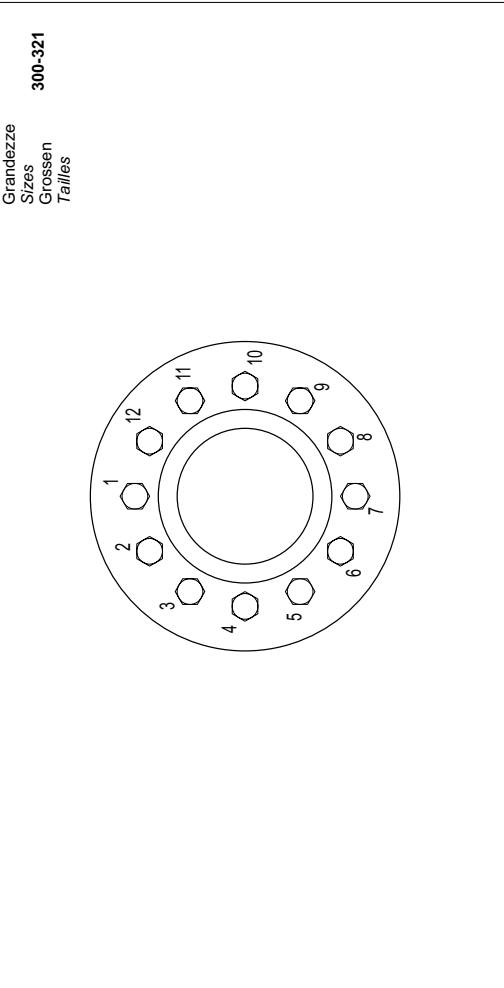
Die Achsstrebe mit Spannschrauben mit Mindestfestigkeitsklasse 8,8 und mit einem Anzugsmoment von 70% ihrer Biegegrenze befestigen. Die Oberflächen der Kupplungswellen im und außerhalb des Getriebes reinigen und entfetten.

Die Kupplung an der Getriebewelle nach einer leichten Schmierung ihrer externen Oberfläche anbauen. Eine erste Gruppe aus 3 Schrauben anziehen, diese den Spitzen eines Dreiecks mit gleichlangen Seiten entsprechend anordnen (Beispiel: die Schrauben Pos. 1-5-9 der Zeichnung Abb.15). Das Getriebe auf die anzutreibende Welle passen.

Die Schrauben graduell und in mehreren Gängen anziehen, bis alle auf den Anzugsmoment, der in der Tabelle 2 angegeben wird und der sich dem Typ von Kupplung/Getriebe entsprechend ändert, festgesetzt sind. Siehe Zeichnung (Abb.14).

HINWEIS: Diametral gegenüberliegende Schrauben nicht befestigen.

Remarque: ne pas serrer en séquence des vis diamétralement opposées.



Viti per giunti ad attrito Screws for shrink disks Schrauben für Reibkupplungen Vis pour joints sous friction

Riduttore-giunto/Gearbox-joint Getriebe-Kupplung/Reducteur-joint		300	301	303	305	306	307
Vite/Screw/Schraube/Vis		M6	M6	M8	M8	M10	M10
Quantità/Quantity/Menge/Quantité		8	8	12	12	9	12
Classe/Class/Klasse/Classe		10.9	10.9	10.9	10.9	10.9	10.9
Coppia di serraggio/Tightening torque Anzugsmoment/Couple de serrage		Nm	12	30	30	58	58

Riduttore-giunto/Gearbox-joint Getriebe-Kupplung/Reducteur-joint		309	310	311	313	315	317	319	321
Vite/Screw/Schraube/Vis		M16	M16	M16	M16	M20	M20	M20	M24
Quantità/Quantity/Menge/Quantité		8	8	10	10	12	14	24	21
Classe/Class/Klasse/Classe		10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
Coppia di serraggio/Tightening torque Anzugsmoment/Couple de serrage		Nm	250	250	250	490	490	490	840

3 - COLLEGAMENTI

- Fissare gli organi di collegamento in entrata ed uscita al riduttore o motoduttore evitando di battere con martello o equivalenti. Utilizzare per l'inserimento degli organi le viti di servizio e i forti filettati presenti negli alberi. Prima di montare gli organi di collegamento avere cura di pulire gli alberi eliminando grasso o protettivi eventualmente presenti.

3 - CONNECTIONS

- Secure the connection parts to gearbox or gearmotor input and output. Do not tap them with hammers or similar tools. To insert these parts, use the service screws and threaded holes provided on the shafts. Be sure to clean off any grease or protectants from the shafts before fitting any connection parts.

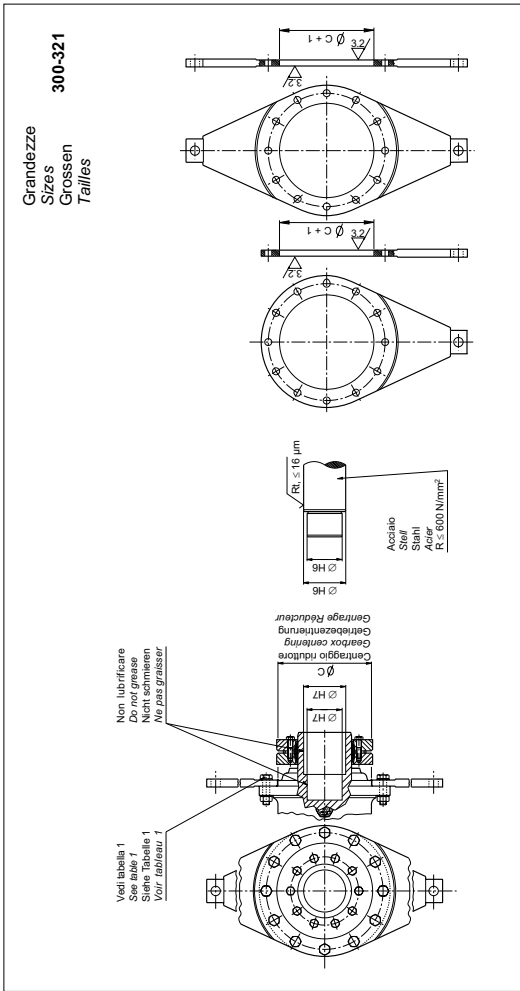
3 - ANSCHLÜSSE

- Die Anschlußteile im An- und Abtrieb des Getriebes oder des Getriebemotors befestigen, dabei ist ein Einklopfen dieser unter Anwendung eines Hammers oder anderer gleichartiger Instrumente zu vermeiden. Zum Einführen der Teile die Service-schrauben und die Gewindebohrungen der Wellen verwenden. Vor der Montage der Verbindungsstelle, die Wellen sorgfältig von Fett oder eventuell vorhandenen Schutzzitteln reinigen.

3 - RACCORDEMENTS

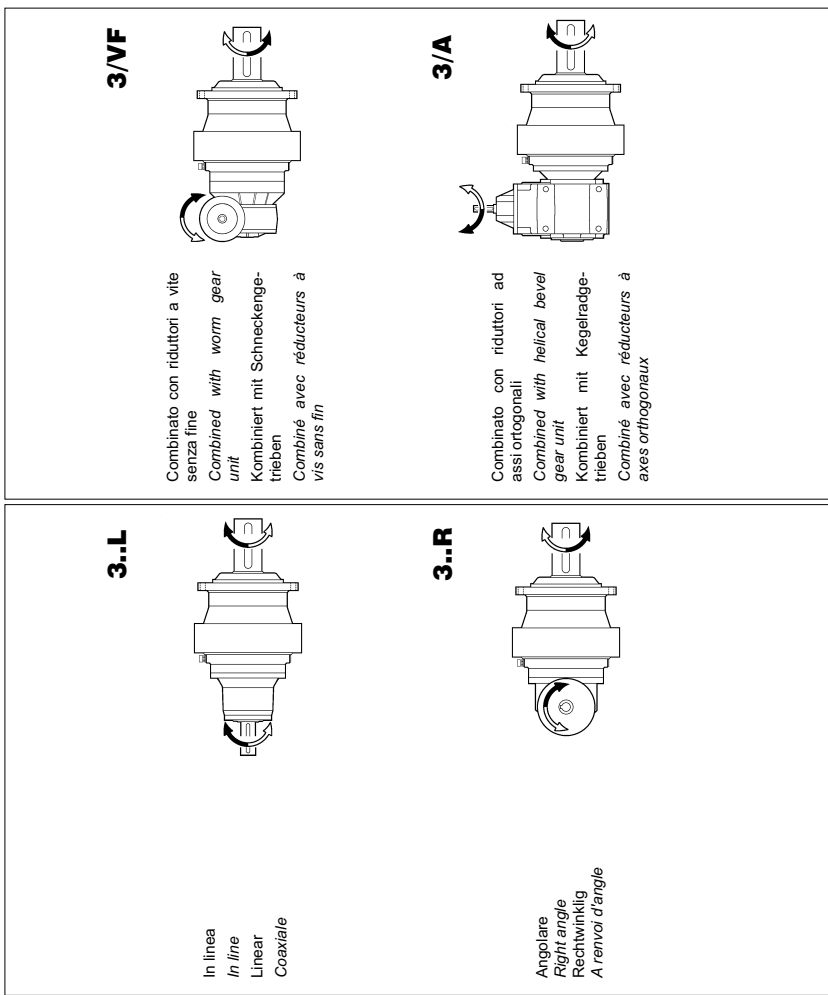
- Fixer les éléments de raccordement en entrée et en sortie du réducteur ou du motoreducteur en évitant de frapper avec un marteau ou autre. Pour l'introduction des organes, utiliser les vis appropriées et les orifices filetés présents sur les arbres. Avant de monter les éléments de raccordement, nettoyer les arbres en éliminant les graisses ou produits de protection éventuellement présents.

(FIG. 14)



- | | | | |
|--|--|--|---|
| - Versi di rotazione.
Al momento del collegamento verificare con l'auto delle seguenti illustrazioni il verso di rotazione degli alberi a seconda di ciò che si ha in ingresso. | - Direction of rotation
When couplings the output shaft, refer to the following diagrams to ensure that the direction of rotation is correct for the input. | - Drehrichtung
Beim Anschluss mit Hilfe der nachfolgenden Darstellungen die korrekte Drehrichtung je nach Drehrichtung am Antrieb prüfen. | - Sens de rotation.
Lors de la liaison, assurez à l'aide des illustrations des arbres en fonction de ce dont on dispose en entrée. |
|--|--|--|---|

(FIG. 16)



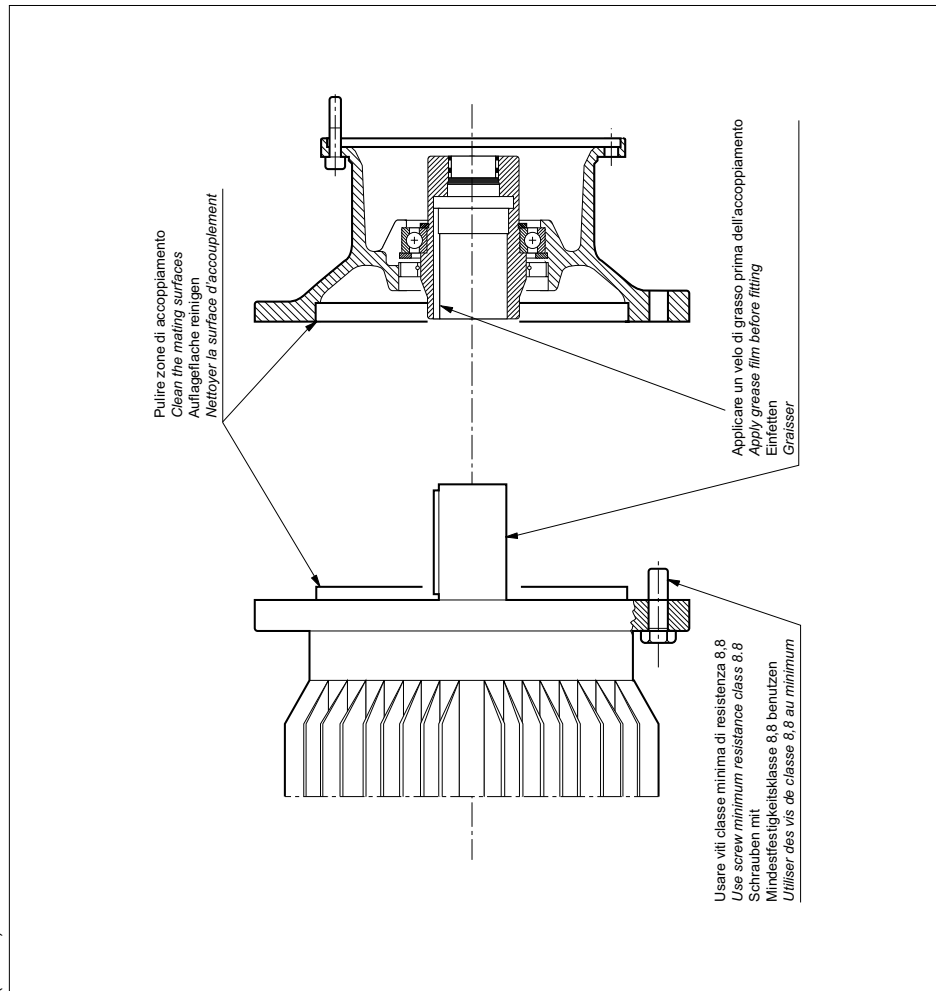
- | | | | |
|--|---|--|---|
| NOTA: | NOTE: | ANMERKUNG: | NOTA: |
| Non usare martelli od altri organi meccanici per forzare l'inserimento di giunti, flange od altro. | Never use hammers or other mechanical means to force disks, flanges, etc. into place. | Keine Hämmer oder sonstige mechanischen Organe benutzen, um das Einsetzen bzw. die Verbindung von Kupplungen d'accouplements, de | Ne pas utiliser de marteau ou d'autres organes mécaniques pour permettre l'introduction d'accouplements, de |

Pulire gli alberi dai protettivi prima di accoppiare l'organo da collegare. Spalmare il velo di grasso per favorire il montaggio.	Clean all protective coatings off shafts before coupling units together. Apply a thin smear of grease to facilitate assembly.	Die Wellen von den Schutzmitteln reinigen, bevor die Verbindungen hergestellt werden. Eine dünne Schicht Fett auftragen, um die Montage zu vereinfachen.	Nettoyer les arbres des vernis de protection, avant de monter l'organe à accoupler. Enduire les pièces d'un voile de graisse pour favoriser le montage.
---	---	--	---

Nettoyer les arbres des vernis de protection, avant de monter l'organe à accoupler. Enduire les pièces d'un voile de graisse pour favoriser le montage.

17

(FIG. 17)



18

COLLEGAMENTO IN ENTRATA

INPUT COUPLINGS

ANSCHLÜSSE AM EINGANG

LIAISON EN ENTREE

Collegamento al motore elettrico

Connection to electric motor

Anschluss an den Elektromotor

Liaison au moteur électrique

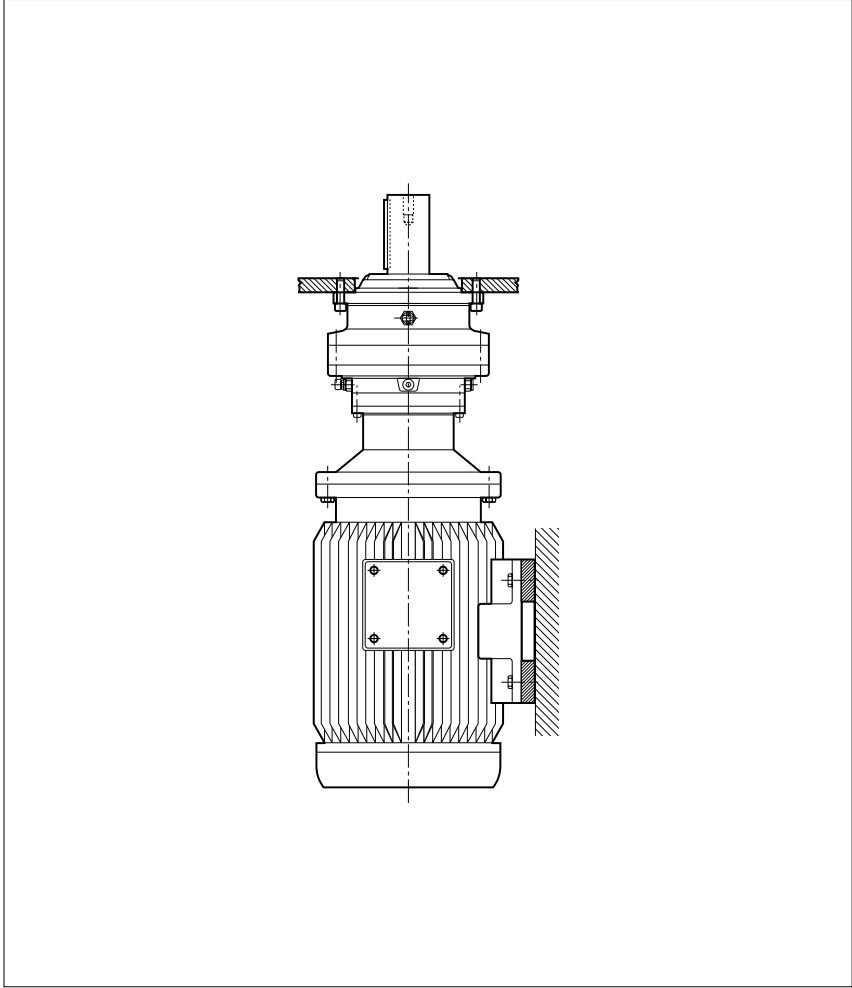
In caso di motori di elevata potenza usare motori in esecuzione B3-B5 opportunamente supportati.

With high power motors always use suitably supported B3-B5 mountings.

Bei Motoren mit hoher Leistung sind Motoren in Ausführung B3-B5 anzuwenden, die gut gelagert sind.

En cas d'utilisation de moteurs de puissance élevée, prévoir ces derniers en exécution B3-B5 supportés en conséquence.

(FIG. 18)



Nota: i motori devono essere sempre perfettamente allineati sia in caso di accoppiamento tra albero motore e albero in ingresso tramite giunto sia soprattutto in caso di accoppiamento diretto.

Note: Ensure that the motors are perfectly aligned. This is important when joints are used between the motor shaft and the input shaft, and even more, so in cases of direct coupling.

Anmerkung: die Motoren müssen stets gut geflüchtet sein, sowohl bei Verbindung von Motorwelle und Getriebe-Antriebswelle als auch insbesondere bei direkter Verbindung.

Remarque: Les moteurs doivent toujours être parfaitement alignés en cas de couplage entre arbre moteur et arbre d'entrée par l'intermédiaire d'un accouplement sur-direct.

Una posizione errata può causare danni ai cuscinetti, sia del motore che della predisposizione motore.

Incorrect alignment can cause damage to both motor and input side bearings.

Eine falsche Position kann zu Schäden an den Lagern des Motors als auch der Motorvorbereitung führen.

Une position erronée peut endommager les roulements du moteur ou de la predisposition moteur.

COLLEGAMENTO ALL'ALBERO VELOCE

HIGH SPEED SHAFT COUPLINGS

VERBINDUNG AN DIE ANTRIEBSWELLE

LIAISON A L'ARBRE RAPIDE

Pulire prima di accoppiare gli organi.

Clean all units prior to assembly.

Die Organe vor Anschluß reinigen.

Procéder au nettoyage, avant d'accoupler les organes.

In caso di montaggio pulegge per trasmissioni a cinghia, gli alberi devono essere paralleli e le pulegge devono essere allineate.

When fitting belt driven pulleys, make sure that the shafts are perfectly parallel and that the pulleys themselves are aligned with each other.

Bei Montage von Riemenscheiben müssen die Wellen parallel stehen und die Riemenscheiben gut ge-fluchtet sein.

En cas de transmission à courroie, les arbres doivent être parallèles et les poulies alignées.

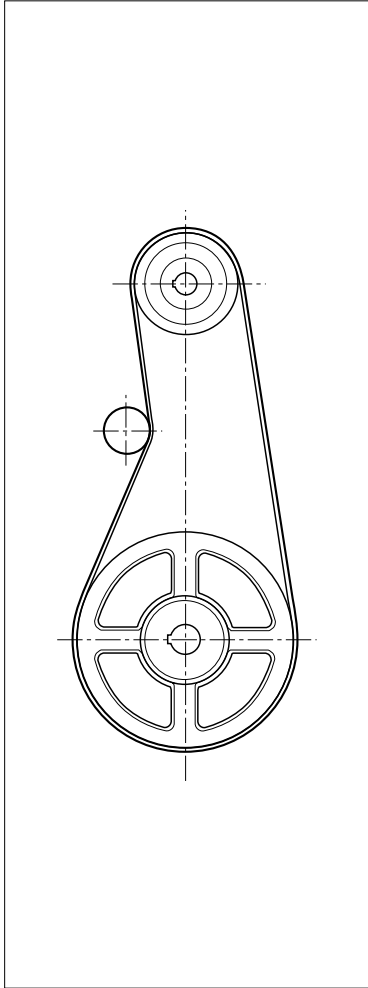
Non tendere la cinghia più del necessario in quanto una eccessiva tensione può causare danni ai cuscinetti.

Avoid over tensioning the belts since excess tension can cause bearing failure.

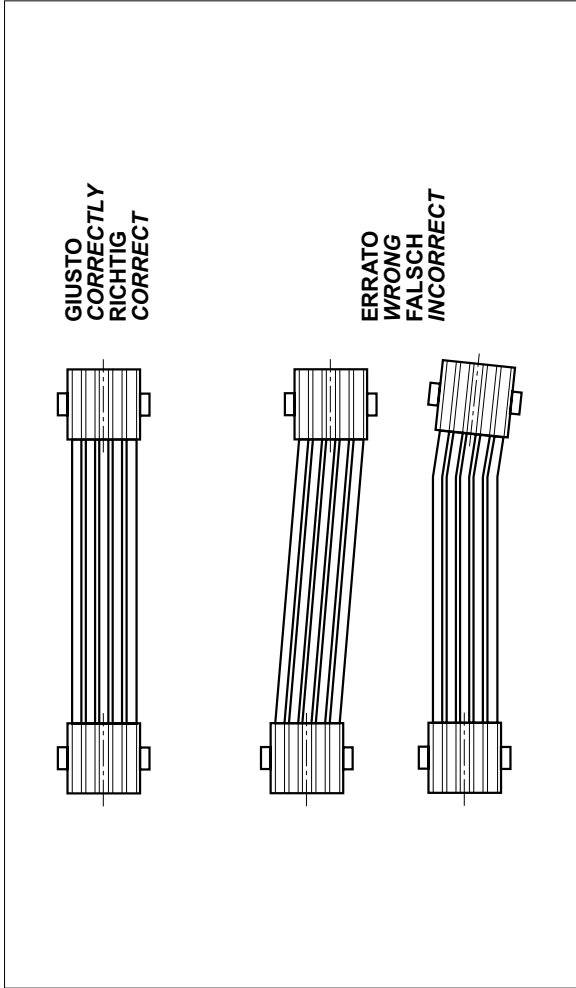
Den Riemen nicht übermäßig spannen, da ein zu hohe Spannung zu Schäden an den Lagern führen kann.

Ne pas tendre la courroie plus que nécessaire car une tension excessive peut entraîner des dommages aux roulements.

(FIG. 19)



(FIG. 20)



COLLEGAMENTO AL MOTORE IDRAULICO
Togliere il cappello di protezione. Le predisposizioni per motori idraulici sono di due tipi:

a) Versione con O-ring di tenuta olio fra flangia motore e riduttore (FIG. 21).

b) Versione con anello di tenuta già montato sul giunto di collegamento (FIG. 22).

HYDRAULIC MOTOR COUPLINGS
Remove the protective cap. Two types of hydraulic motor couplings are possible:

a) With O ring seal between motor flange and gearbox. (FIG. 21)

b) With seal incorporated in motor joint. (FIG. 22)

ANSCHLUß AN HYDRAULIKMOTOR
Die Schutzkappe entfernen. Es bestehen zwei Arten Vorbereitung für den Anschluß von Hydraulikmotoren:

a) Ausführung mit O-Dicht-ring für Öl zwischen Motorflansch und Getriebe. (Abb. 21)

b) Ausführung mit schon montiertem Dichtung an der Verbindungskupplung. (Abb. 22)

LIAISON AU MOTEUR HYDRAULIQUE
Enlever le capuchon de protection. Les prédispositions pour moteurs hydrauliques sont de deux types:

a) Version avec joint d'étanchéité O-ring entre bride moteur et réducteur. (Figure 21)

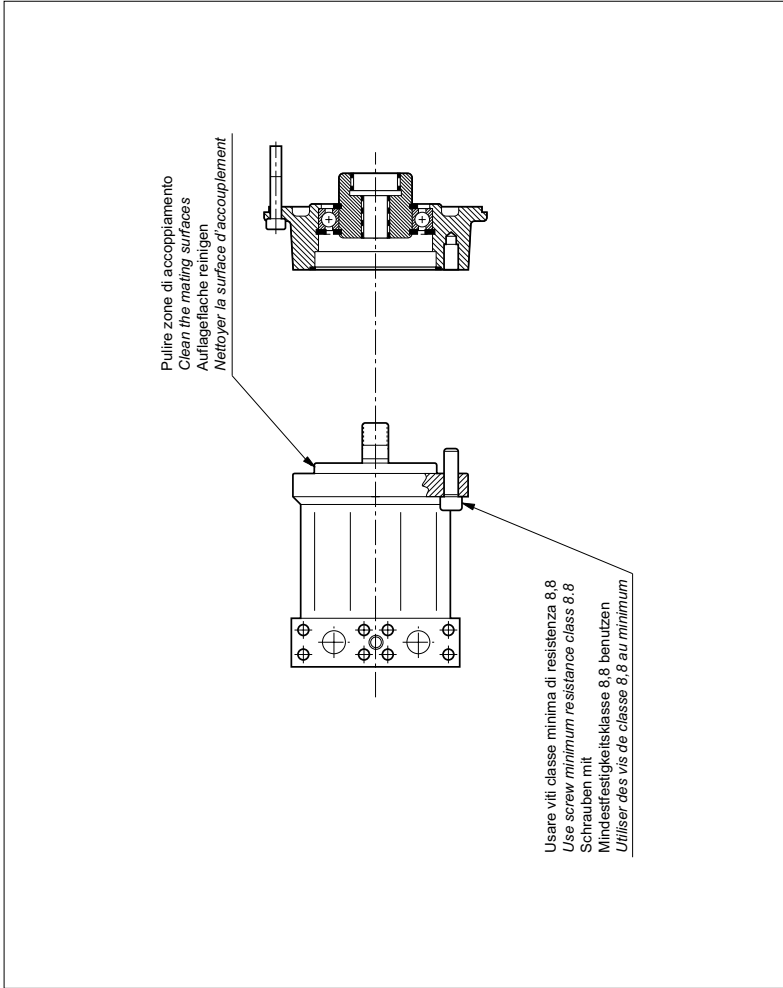
b) Version avec bague d'étanchéité déjà montée sur le manchon de liaison. (Figure 22)

Nel caso a) montare l'O-ring che assicura la tenuta fra riduttore e motore avendo cura di mantenerlo nella propria sede e di non rovinarlo.

Im Fall a) den O-Ring montieren, der für die Abdichtung zwischen Getriebe und Motor sorgt, hierbei darauf achten, dass er gut in seinen Sitz eingesetzt und nicht beschädigt wird.

Dans le cas a) monter le joint O-ring qui assure l'étanchéité entre réducteur et moteur en prenant soin de le maintenir dans son logement et de ne pas le blesser.

(FIG. 21)



Im Fall b) ist es nicht notwendig, die gute Abdichtung sicherzustellen, da dies schon von der Motorkupplung gewährleistet wird. Man sollte jedoch etwas Fett auf die Motorwelle streichen. In beiden Fällen die Zentrierbohrung und Kupplung zum Anschluss des Motors gut reinigen. Den Motor einsetzen, die Schrauben zur Befestigung mit Flanschen anziehen. Stets Schrauben mit Mindest-Festigkeitsklasse 8,8 benutzen.

With type b) connections, no specific action is required to ensure oil-tight operation since the seal is incorporated in the motor casing. Apply a thin smear of grease to the motor shaft to facilitate assembly. For both types of coupling, clean all mating surfaces couplings first. Fit the motor and tighten the flange securing bolts. Always use bolts of minimum resistance class 8.8.

Dans le cas b) il n'y a rien à faire pour assurer l'étanchéité dans la mesure où celle-ci est déjà effectuée sur le manchon de liaison au moteur. Appliquer seulement un voile de graisse sur l'arbre moteur. Dans les deux cas nettoyer les zones de centrage et le manchon qui reçoit le moteur, monter le moteur et serrer les vis de liaison avec la bride. Toujours utiliser des vis de classe minimum 8,8.

Nel caso b) non occorre far nulla per assicurare la tenuta dell'olio in quanto questa è già effettuata sul giunto motore, applicare solo un velo di grasso sull'albero motore. In ambedue i casi pulire le zone di centraggio ed il giunto dove va inserito il motore, inserire il motore e serrare le viti di assemblaggio con la flangia.

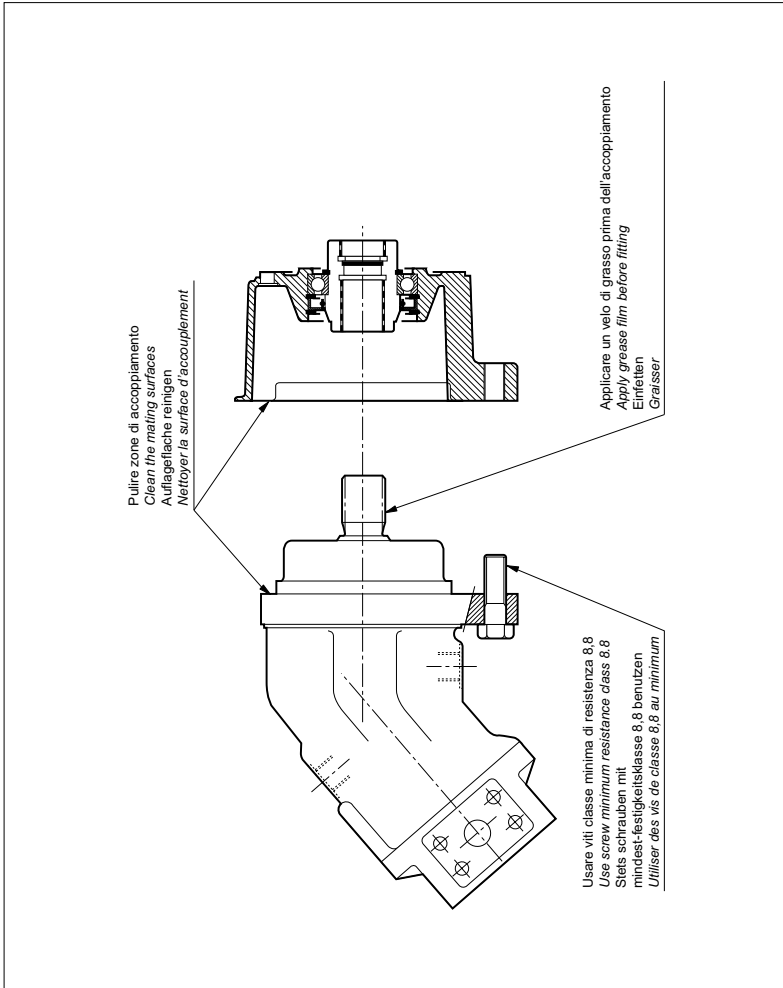
Usare sempre viti con classe di resistenza minima 8,8.

Im Fall b) ist es nicht notwendig, die gute Abdichtung sicherzustellen, da dies schon von der Motorkupplung gewährleistet wird. Man sollte jedoch etwas Fett auf die Motorwelle streichen. In beiden Fällen die Zentrierbohrung und Kupplung zum Anschluss des Motors gut reinigen. Den Motor einsetzen, die Schrauben zur Befestigung mit Flanschen anziehen. Stets Schrauben mit Mindest-Festigkeitsklasse 8,8 benutzen.

With type b) connections, no specific action is required to ensure oil-tight operation since the seal is incorporated in the motor casing. Apply a thin smear of grease to the motor shaft to facilitate assembly. For both types of coupling, clean all mating surfaces couplings first. Fit the motor and tighten the flange securing bolts. Always use bolts of minimum resistance class 8.8.

Dans le cas b) il n'y a rien à faire pour assurer l'étanchéité dans la mesure où celle-ci est déjà effectuée sur le manchon de liaison au moteur. Appliquer seulement un voile de graisse sur l'arbre moteur. Dans les deux cas nettoyer les zones de centrage et le manchon qui reçoit le moteur, monter le moteur et serrer les vis de liaison avec la bride. Toujours utiliser des vis de classe minimum 8,8.

(FIG. 22)



COLLEGAMENTO AL FRENO

Per riduttori predisposti per motori idraulici e completi di freno, collegarsi all'atto della installazione con un apposito tubo del circuito idraulico al foro di comando previsto sul corpo freno.

BRAKE COUPLINGS

With gearboxes designed for coupling to a hydraulic motor and pre-fitted with a hydraulic brake, simply connect the hydraulic circuit to the delivery hole on the brake body when assembling the units.

ANSCHLUß AN DIE BREMSE

Für Getriebe, die zur Montage mit Hydraulikmotoren vorbereitet und komplett mit Bremse ausgestattet sind, ist bei Installation mit einem eigens vorgesehenen Schlauch des Hydrauliksystems die Verbindung mit der Bohrung auf dem Bremskörper herzustellen.

CONNEXION DU FREIN

Pour les réducteurs prédisposés pour moteurs hydrauliques et équipés de frein, relier au moment de l'installation le raccord approprié du circuit hydraulique au trou de commande prévu sur le carter du frein.

Avviamento

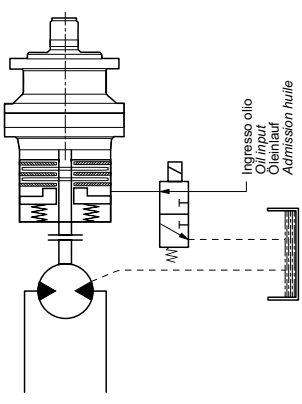
Pressione minima tale da garantire apertura freno (vedi tabella) inferiore 320 bar.

Start-up

Regulate to the minimum pressure which will release the brake (see table). This must be below 320 bar.

Démarrage

Pression minimum pour permettre l'ouverture du frein (voir tableau). Inférieure à 320 bars.



(FIG.23)

DATA TECNICI

TECHNICAL DATA

TECHNISCHES DATEN

DONNEES TECHNIQUES

Freno tipo - Brake type		4...				5...				6...									
Bremse typ - Frein type		A	B	D	F	H	K	L	B	C	E	G	K	L					
Coppia frenante Braking torque Bremsmoment Couple de freinage	Ms daNm	5	10	16	26	33	40	44	40	50	63	80	100	85	110	150	210	260	320
Press. min. apertura Min. release pressure Min. Öffnungsdruck Press. min. ouverture	bar	10	20	30	20	25	30	33	20	27	20	25	32	14	19	25	19	24	28
Pressione max Max. pressure Max. Druck Press. max.	bar	320													35				
Peso Weight Gewicht Poids	Kg	10							18							35			

NOTA: La coppia statica Ms è la max che può esercitare il freno. In condizioni dinamiche la coppia frenante è inferiore. - I valori effettivi di Ms possono variare da -5% a +15% rispetto a quelli indicati in tabella.

NOTE: The values for Ms given above are valid when circuit pressure is 0. If there is any back-pressure in the circuit, contact our technical assistance department. Allow for a variation of -5% to +10% in above values. Braking torque is reduced in dynamic operating condition.

ANMERKUNG: Der statische Bremsmoment Ms ist der max. Wert, den die Bremse ausüben kann. In dynamischem Zustand ist der Bremsmoment geringer. Die effektiven Werte von Ms können von -5% bis +15% von den in der Tabelle angegebenen abweichen.

REMARQUE: le couple statique Ms est le couple max. que le frein peut exercer. En conditions dynamiques le couple de freinage est inférieur. Les valeurs effectives de Ms peuvent varier de -5% à +15% par rapport aux valeurs indiquées sur le tableau.

INSTALLAZIONE MOTORIDUTTORE

Nel casi in cui venga fornito il gruppo motonduttore completo, per l'installazione di sua macchina attenersi alle indicazioni fornite precedentemente.

INSTALLATION OF GEARMOTORS

If a complete gearmotor is supplied, follow the instructions given above for installation to any machine or plant. Two sample diagrams are provided for generic hydraulic and electrical connections. Each individual installation will, of course, have its own specific requirements which must be catered for.

INSTALLATION GETRIEBE-MOTOR

Sollte die komplette Gruppe Getriebemotor geliefert werden, dann sind zur Installation an der Maschine die vorher gemachten Angaben zu befolgen.

INSTALLATION MOTOREDUCTEUR

Dans de nombreux cas TRASMITAL fournit le groupe motoreducteur complet. Pour son installation il convient dans tous les cas de respecter les indications sus-mentionnées. Pour les branchements hydrauliques ou électriques il est fourni à titre d'exemple deux types de schémas auxquels on peut se référer d'une façon générale, mais chaque installation a ses exigences qui doivent être évaluées à chaque fois par le constructeur.

INSTALLAZIONE MOTOREDUCTORE

Con motore elettrico.

Vedere schemi qui di seguito.

INSTALLATION OF GEARMOTORS

With electric motors.

See generic diagrams to follow.

INSTALLATION GETRIEBEMOTOR

Mit Elektromotor.

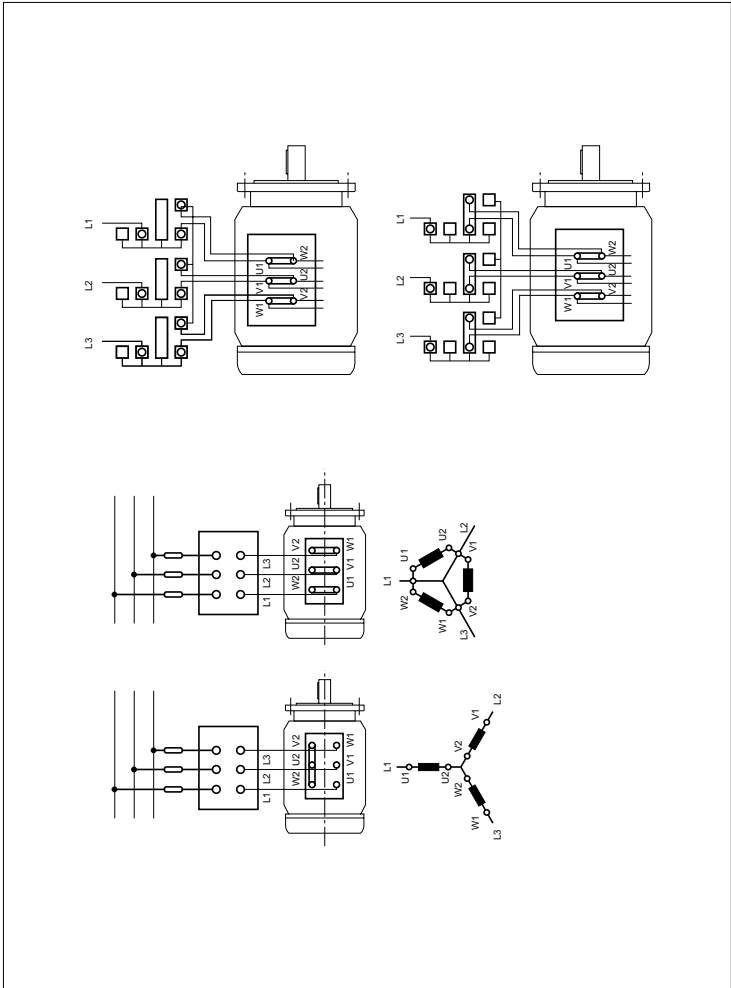
Siehe folgendes Diagramm.

INSTALLATION MOTOREDUCTEUR

Avec moteur électrique.

Voir schémas suivants.

(FIG.24)



INSTALLAZIONE MOTORIDUTTORE
- Con motore idraulico TRASMITAL MG.

INSTALLATION OF GEARMOTORS
- With hydraulic motor TRASMITAL MG.

INSTALLATION GETRIEBE-MOTOR
- Mit Hydraulikmotor TRASMITAL MG.

INSTALLATION GETRIEBE-MOTOREDUCTEUR
- Avec moteur hydraulique TRASMITAL MG.

In aggiunta alle norme relative alla installazione del riduttore, è raccomandato seguire le seguenti norme per l'installazione del motore idraulico.

Zusätzlich zu den Normen für die Vorgangsweise bei der Installation des jeweiligen Getriebes, wird empfohlen, die folgenden Anweisungen auch für die Installation des Hydraulikmotors zu befolgen.

En plus des règles concernant l'installation du réducteur, on préconise de suivre les instructions ci-dessous pour l'installation du moteur hydraulique.

a) Collegamento al circuito idraulico

a) Connection to the hydraulic circuit

a) Raccordement au circuit hydraulique

I motori possono essere collegati sia a circuiti del tipo chiuso che aperto.

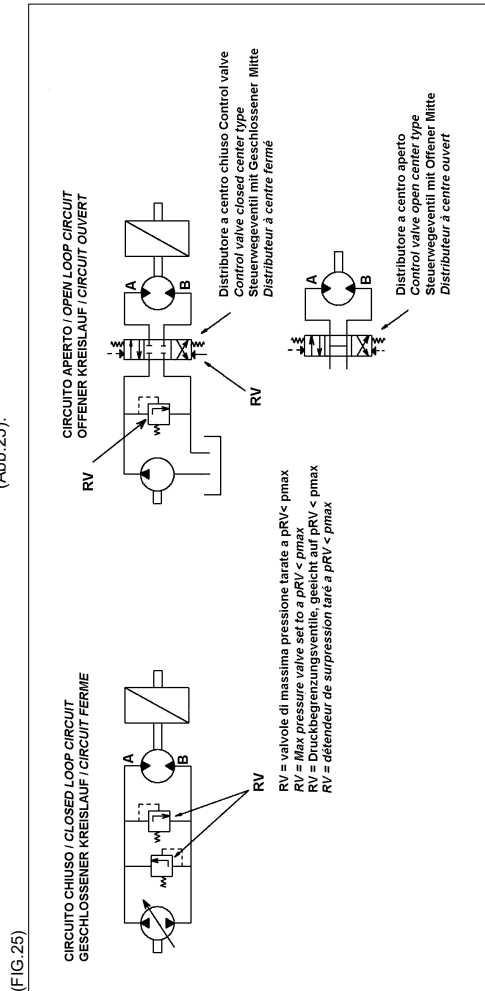
Nel caso di circuito aperto la elettrovalvola o distributore di comando può essere sia di tipo a centro chiuso che aperto.

The hydraulic motor delivery side should always have a max. pressure valve set to a value not exceeding the P_{int} value allowed for the hydraulic motor. See hydraulic diagrams (FIG.25).

Die Motoren können, sowohl an geschlossene, als auch an offene Kreisläufe verwendet werden.

Handelt es sich um einen offenen Kreislauf kann das Elektroventil oder das Steuerwegeteil, sowohl vom Typ mit geschlossener Mitte, als auch mit offener Mitte sein.

Es ist erforderlich, daß am Zweig des Kreislaufs, gegenüber der Druckleitung des Hydraulikmotors immer ein Druckbegrenzungsventil montiert ist, welches auf einen Wert geeicht ist, der den am Hydraulikmotor zulässigen Wert von P_{int} nicht überschreitet. Siehe Hydraulikpläne (Abb.25).



Nel caso in cui questo non sia possibile in quanto il circuito deve comandare altri azionamenti a pressione più elevata e/o nel caso cui si abbia un distributore a centro chiuso ed il motore aziona organi ad

If not possible, because the circuits control other devices needing a higher pressure and/or a closed center control valve is fitted and the motor controls parts with a high

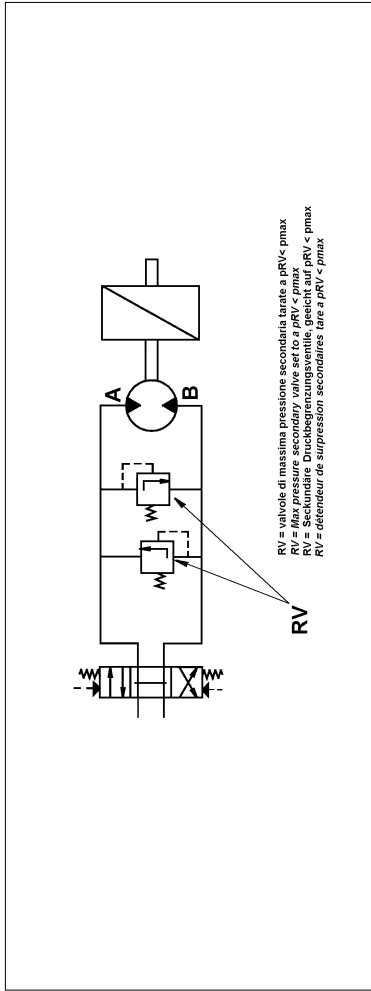
Si cela n'est pas possible, weil der Kreislauf noch andere, unter höheren Druck stehende Antriebsmittel, ayant une pression plus élevée, et/ou qu'il y a un distributeur à centre fermé et le moteur actionne des orga-

elevato momento d'inerzia occorre montare valvole di massima pressione secondarie il più vicino possibile al motore. Vedi schema (FIG.26).

secondary valves should be as close as possible to the motor. See diagram (FIG.26).

Motor Organe mit einem erhöhten Trägheitsmoment annehmen, muß man so nahe wie möglich am Motor sekundäre Druckbegrenzungsventile montieren. Siehe Schema (Abb.26).

(FIG.26)



b) Collegamento foro di drenaggio T

b) Connection of drain hole T

b) Raccordement orifice de purge T

In esecuzione standard i motori vengono forniti senza foro di drenaggio. In questo caso il motore è provvisto di drenaggio interno. Questo soddisfa la maggioranza delle applicazioni dove il funzionamento è intermittente e la pressione di comando è inferiore al 50% della pressione sopportabile dal motore.

Standard motors are supplied with no drain hole. In this case, the motor has an internal drain system. This meets most applications with intermittent duty and average control pressure under 50% of the max. pressure bearable by the motor.

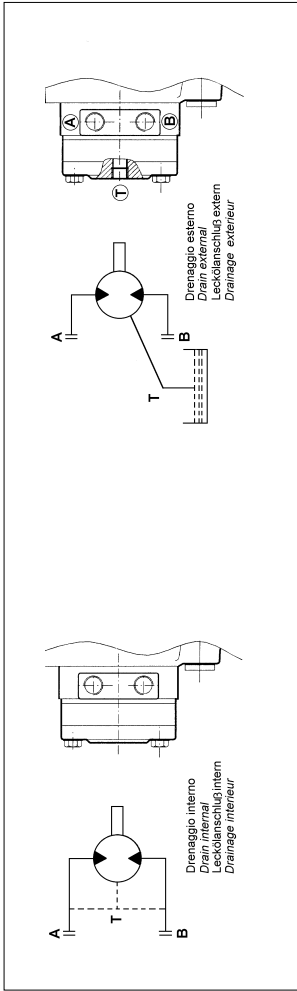
L'exécution standard des moteurs ne prévoit pas d'orifice de purge. Dans ce cas le moteur est équipé d'un système de purge interne. Cela satisfait à la plupart des applications où le fonctionnement est intermittent et la pression moyenne de commande est inférieure à 50% de la pression maximale admissible pour le moteur.

Se il funzionamento è continuo o intermittente con una percentuale di funzionamento maggiore del 50% e la pressione media di comando è superiore al 50% della pressione, occorre richiedere il motore in esecuzione con drenaggio esterno e collegare il foro di drenaggio T al serbatoio.

In continuous or intermittent duty with operation percentage over 50% and average control pressure over 50% of the max. pressure, motor should be ordered in the external drain version and the drain hole T should be connected to the tank.

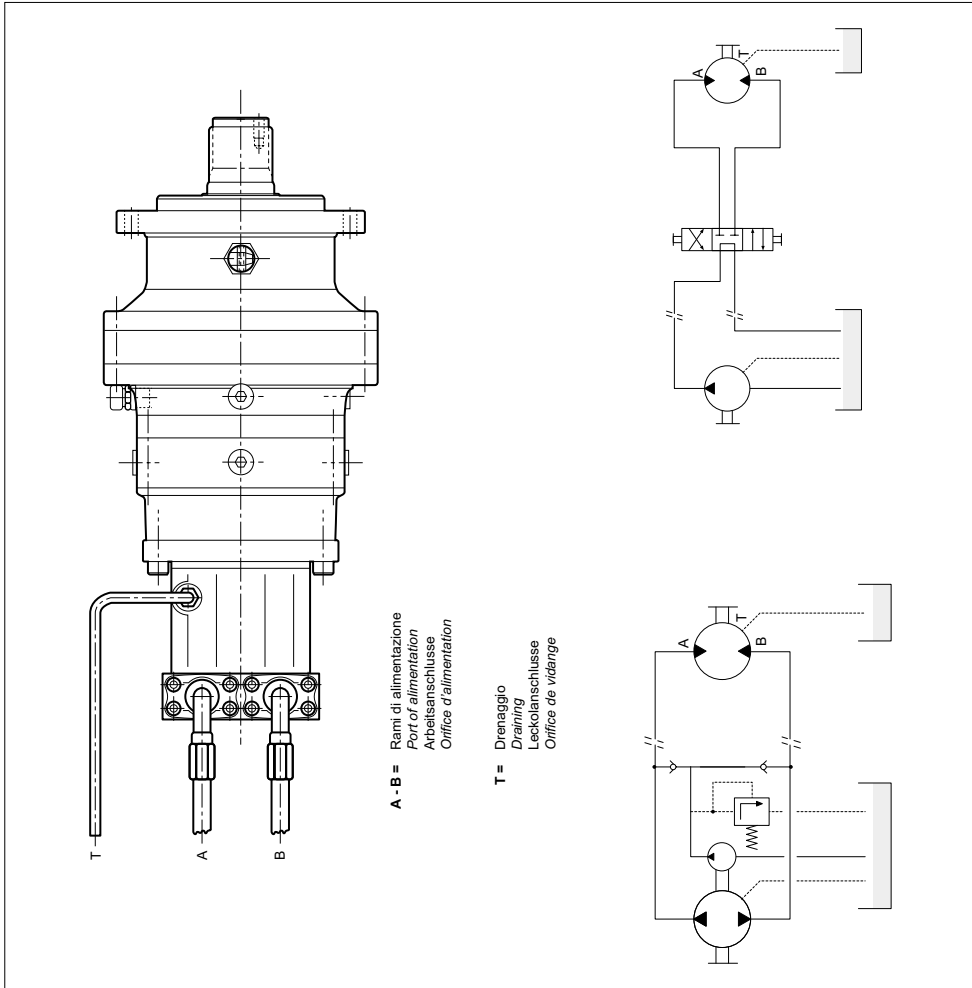
Si le fonctionnement est continu ou intermittent, avec un pourcentage de fonctionnement supérieur à 50% et la pression moyenne de commande est supérieure à 50% de la pression, il faut commander le moteur dans la variante avec purge extérieure et raccorder l'orifice de purge T au réservoir.

(FIG.27)



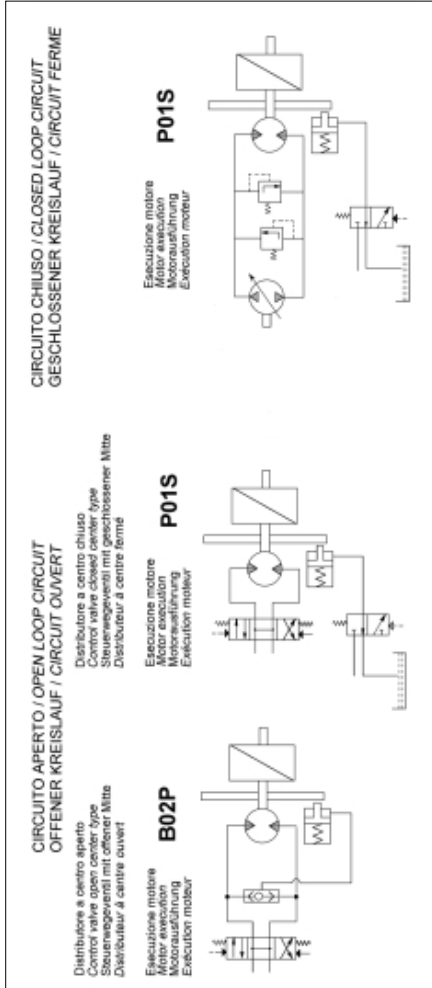
- Con motore idraulico**
Con motore idraulico tutti i motori devono essere riempiti col fluido idraulico prima della messa in esercizio e durante il montaggio nell'impianto. Posizionare il foro di drenaggio nella posizione più alta per fare il riempimento. Fare attenzione a che le tubazioni siano dislocate in modo da evitare che il corpo del motore si svuoti per non avere inclusioni di aria che potrebbero causare difficoltà di aspirazione nelle pompe.
- With hydraulic motors**
All hydraulic motors must be filled with hydraulic fluid prior to installation and start-up. Turn the drain hole upwards to fill the motor. Make sure that the hydraulic hoses are arranged so that they do not drain the motor, and so that air pockets do not form, causing pump suction malfunctions during operation. Luftblasen zu vermeiden, die zu Schwierigkeiten beim Ansaugen der Pumpen führen könnten.
- Mit Hydraulikmotor**
Mit Hydraulikmotor müssen alle Motoren vor Inbetriebnahme bei Montage der Anlage mit Hydrauliköl gefüllt werden. Die Ablassbohrung in der höchsten Stellung bringen, um zu füllen. Darauf achten, daß die Leitungen so angeordnet sind, dass eine Entleerung des Motors vermieden wird, um Luftblasen zu vermeiden, die zu Schwierigkeiten beim Ansaugen der Pumpen führen könnten.
- Avec moteur hydraulique**
Tous les moteurs doivent être remplis avec du fluide hydraulique avant la mise en fonction et pendant le montage dans l'installation. Positionner le trou de drainage dans la position la plus haute pour effectuer le remplissage. Faire attention que les tubes soient déconnectés de façon à éviter que le corps moteur se vide pour ne pas avoir d'inclusion d'air qui pourrait causer des difficultés d'aspiration dans les pompes.

(FIG.29)



- c) Comando freno**
Nel caso in cui il motoriduttore sia dotato di freno, il motore può essere in due esecuzioni: B02P oppure P01S. Nella esecuzione B02P, il comando del freno è interno, diretto dal motore. Nella esecuzione P01S, occorre un ramo ausiliario per il comando del freno. Vedere lo schema seguente (FIG.28).
- c) Bremssteuerung**
Ist der Getriebemotor mit einer Bremse ausgestattet, können zwei Motorausführungen verwendet werden: B02P oder P01S. In der B02P version, the motor has an in-built, direct brake control system. In the P01S version, an auxiliary branching is required to control the brake. See the following diagram (FIG.28).
- c) Commande frein**
Au cas où le motoreducteur serait équipé de frein, le moteur pourait avoir deux exécutions: B02P ou P01S. Dans l'exécution B02P, la commande du frein est à l'intérieur, derrière le moteur. Dans l'exécution P01S, il faut disposer d'une branche auxiliaire pour la commande du frein. Voir schéma suivant (FIG.28).

(FIG.28)



- d) Tipo olio idraulico**
E' raccomandato l'uso di olio idraulico minerale con viscosità ISO VG 46 (46 Cst a t = 40°C).
E' raccomandabile che la temperatura dell'olio sia compresa fra +30 °C e +70 °C.
- d) Hydraulic oil**
Use hydraulic mineral oil with viscosity ISO VG 46 (46 Cst at t = 40°C).
It is recommended the oil temperature should be between +30°C and +70°C.
- d) Type d'huile hydraulique**
On préconise d'utiliser de l'huile hydraulique minérale avec viscosité ISO VG 46 (46 Cst à t = 40°C).
On préconise que le domaine de température de l'huile soit compris entre +30 °C et +70 °C.
- e) Filtraggio**
Per assicurare un funzionamento affidabile del motore ed una durata è estremamente importante che il circuito idraulico sia dotato di filtro con capacità filtrante tale da assicurare un grado di pulizia dell'olio secondo grado:
- e) Oil filtering**
For reliable motor operation and long life, it is important that the hydraulic circuit has a filter for a proper oil filtering according to the following degree:
- e) Filtrage**
Pour assurer un fonctionnement fiable du moteur, ainsi que sa longévité, il est extrêmement important que le circuit hydraulique soit équipé de filtre, ayant une capacité de filtration en mesure d'assurer un niveau de propreté de l'huile conforme aux degrés suivants:
- | | | |
|-------------------------|-------------------------|-------------------------|
| grado 9 NAS 1638 | degré 9 NAS 1638 | degré 9 NAS 1638 |
| grado 6 SAE | degré 6 SAE | degré 6 SAE |
| grado 18/15 SO DIS 4406 | degré 18/15 SO DIS 4406 | degré 18/15 SO DIS 4406 |

4 - LUBRIFICAZIONE (prima della messa in funzione)

La lubrificazione è normale in bagno d'olio. A seconda dell'applicazione se in impianto o su macchina mobile attenersi alle seguenti tabelle:

- 1) Macchine mobili: oli a norme SAE 80 W/90 con caratteristiche API GL5.
- 2) Impianti industriali: oli a norme ISO VG 150 con caratteristiche E.P.

Nella tabella seguente sono riportati le marche più diffuse di lubrificanti con i tipi di oli consigliati per applicazioni normali.

4 - SCHMIERUNG (Von Inbetriebnahme)

Die Schmierung erfolgt normal im Ölbad. Je nach Einsatz, d.h. Festanlage oder bewegliche Maschine, sollte man sich an folgenden Tabellen halten:

- 1) Bewegliche Maschinen: Öl gem. Norm SAE 80 W/90 mit Eigenschaften API GL5
- 2) Industrieanlagen: Öl gem. Norm ISO VG 150 mit Eigenschaften E.P.

In der nachfolgenden Tabelle sind die üblichsten Schmiermittelmarken aufgeführt, mit Angabe der empfohlenen Öltypen d'huile conseillées pour des applications normales.

4 - LUBRIFICATION (avant la mise en route)

La lubrification normale s'effectue en bain d'huile. Selon l'application, installation fixe ou équipement mobile, se reporter aux tableaux suivants:

- 1) Machines mobiles: Huiles aux normes SAE VG 150 avec caractéristiques API GL5.
- 2) Installations industrielles: Huiles aux normes ISO VG 150 avec caractéristiques E.P.

Temperatura ambiente Ambiente Temperaturumgebung Température ambiante	-10°C / +30°C		+20°C / +45°C		-10°C / +30°C		+20°C / +45°C	
	IMPIANTI INDUSTRIALI / INDUSTRIAL PLANTS INDUSTRIEANLAGEN / INSTALLATIONS INDUSTRIELLES	MACCHINE MOBILI / MOBILE MACHINES BEWEGLICHE MASCHINEN / MACHINES MOBILES	IMPIANTI INDUSTRIALI / INDUSTRIAL PLANTS INDUSTRIEANLAGEN / INSTALLATIONS INDUSTRIELLES	MACCHINE MOBILI / MOBILE MACHINES BEWEGLICHE MASCHINEN / MACHINES MOBILES	IMPIANTI INDUSTRIALI / INDUSTRIAL PLANTS INDUSTRIEANLAGEN / INSTALLATIONS INDUSTRIELLES	MACCHINE MOBILI / MOBILE MACHINES BEWEGLICHE MASCHINEN / MACHINES MOBILES	IMPIANTI INDUSTRIALI / INDUSTRIAL PLANTS INDUSTRIEANLAGEN / INSTALLATIONS INDUSTRIELLES	MACCHINE MOBILI / MOBILE MACHINES BEWEGLICHE MASCHINEN / MACHINES MOBILES
	norme ISO - con caratteristiche EP. ISO standard - E.P. grade SAE-Normen - E.P. Merkmalen normes ISO - avec caractéristiques E.P.	norme SAE - con caratteristiche API GL5 SAE standard - API GL5 grade SAE-Normen - mit API GL5-Merkmalen normes SAE - avec caractéristiques API GL5						
	ISO VG 150	BLASIA 150	ISO VG 220	BLASIA 220	SAE 80W/90	ROTRA MP	SAE 85W/140	ROTRA MP
AGIP	BLASIA 150	BLASIA 220						
ARAL	DEGOL BG 150	DEGOL BG 220			GETRIEBEOL HYP	HYPOGEAR EP	GETRIEBEOL HYP	HYPOGEAR EP
BP - MACH	ENERGOL GR XP 150	ENERGOL GR XP 220						
CASTROL	ALPHA SP 150	ALPHA SP 220			HYPOX	UNIVERSAL GEAR LUBRICANTE		
CHEVRON	EDNVL GEAR COMPOUND 150	N.L. GEAR COMPOUND 220			TRANSSELF	GEAR OIL GX	PONTONIC MP	PONTIAX HD
ELF	REDUCTELF SP 150	REDUCTELF SP 220						
ESSO	SPARTAN EP 150	SPARTAN EP 220			GEAR OIL GX	PONTONIC MP		
FINA	GLYCOLUBE 150	GLYCOLUBE 220						
I.P.	GIRAN 150	GIRAN 220			PONTIAX HD			
KLÜBER	MELLANA 150	MELLANA 220						
MOBIL	PONTIAX HDS	PONTIAX HDS			MOBILUBE HD	MOBILUBE HD	MOBILUBE HD	MOBILUBE HD
SHELL	LANORA 150	LANORA 220			SPIRAX HD			
TOTAL	SYNTHESO D150 EP	SYNTHESO D220 EP			TRANSMISSION TM	TRANSMISSION TM		

Temperatura sulla carcassa, questa non deve superare nel punto più caldo 170-75°C

Oli a base sintetica

LUBRIFICAZIONE FRENI I freni idraulici a dischi multipli hanno lubrificazione unica con il riduttore.

BREMSE SCHMIERUNG Die hydraulischen Lamellenbremsen werden über die Schmierung des Untersetzungsgetriebes geschmiert.

FREINS LUBRIFICATION Les freins hydrauliques à disques multiples sont lubrifiés avec la même huile que les réducteurs.

Per applicazioni particolari come temperature particolarmente elevate, requisiti di non infiammabilità dell'olio, ecc. interpellare l'Ufficio tecnico TRASMITAL.

Für spezielle Einsatzbedingungen, wie sehr hohe Temperaturen, Notwendigkeit der Verwendung von nicht entflammbarem Öl usw. setzen Sie sich bitte mit dem technischen Büro von Trasmital in Verbindung.

Dans le cas d'applications particulières, avec des températures élevées, où la non inflammabilité de l'huile est requise, etc., contacter le service technique TRASMITAL.

La temperatura massima dell'olio in esercizio continuo non deve superare gli 85°C.

Die maximale Öltemperatur darf im Dauerbetrieb 85°C nicht überschreiten.

Les réducteurs sont livrés sans huile de lubrification.

Tutti i riduttori sono provvisti dei tappi di carico, livello, sfioro e scarico olio.

Per effettuare il riempimento olio occorre avere il riduttore nella esatta posizione di funzionamento, svitare il tappo di carico olio e riempire fino al livello la cui posizione dipende dal tipo di montaggio: orizzontale o verticale.

Per lo scarico svitare il tappo di scarico magnetico e lasciare defluire l'olio.

Per agevolare l'operazione sarebbe meglio che l'olio fosse ancora caldo e che si sia smontato anche un tappo posizionato in alto nel riduttore per avere una circolazione di aria.

Nota: per i riduttori con freno, la lubrificazione del freno è comune a quella del riduttore.

Nota: Pour les réducteurs équipés de frein, la lubrification de ce dernier est commune avec celle du réducteur.

STADIO RIDUZIONE A VITE SENZA FINE (3VF) / WORM REDUCTION MODULE (3VF) SCHNECKENREDUZIERUNGSSTUPE (3VF) / ETAGE DE REDUCTION A VIS SANS FIN (3VF) STADIUM DER REDUKTION MIT UNENDLICHEN WORMEN (3VF) KEGELRADREDUZIERUNGSSTUPE (3VA) / ETAGE DE REDUCTION A AXES ORTHOGONALES (3VA)

Tipo di carico / Type of Load Art der Belastung / Type de charge	0 °C / +20 °C		+20 °C / +40 °C	
	Olio minerale Mineralöl Huile minérale ISO VG	Olio sintetico Synthetisch Huile synthétique ISO VG	Olio minerale Mineralöl Huile minérale ISO VG	Olio sintetico Synthetisch Huile synthétique ISO VG
Carico leggero / Light load / Leicht / Charge légère	150	150	220	220
Carico medio / Medium load / Normal / Charge moyenne	150	150	320	220
Carico pesante / Heavy load / Schwer / Charge lourde	220	220	460	320

REMPIIMENTO

FILLING

REMPLEISSAGE

Alle Getriebe sind mit Füllstopfen, Füllstandsanzeige, Entlüftung und Ölablass ausgestattet. Zum Einfüllen des Öls muss sich das Getriebe in der genau-en Betriebsposition befinden, der von der Einbaulage abhängt: senkrecht oder waagrecht. Zum Ablassen des Öl den magnetischen Ablassstopfen entfernen und das Öl abfließen lassen.

Dieser Vorgang ist einfacher, wenn das Öl noch warm ist und bei abgeschraubtem Nachfüllstopfen, damit die Luft besser nachfließt.

Nota: Für Getriebe mit Bremsen, entspricht die Schmierung der Bremse auf jeden Fall der Getriebeschmierung.

Nota: Pour les réducteurs équipés de frein, la lubrification de ce dernier est commune avec celle du réducteur.

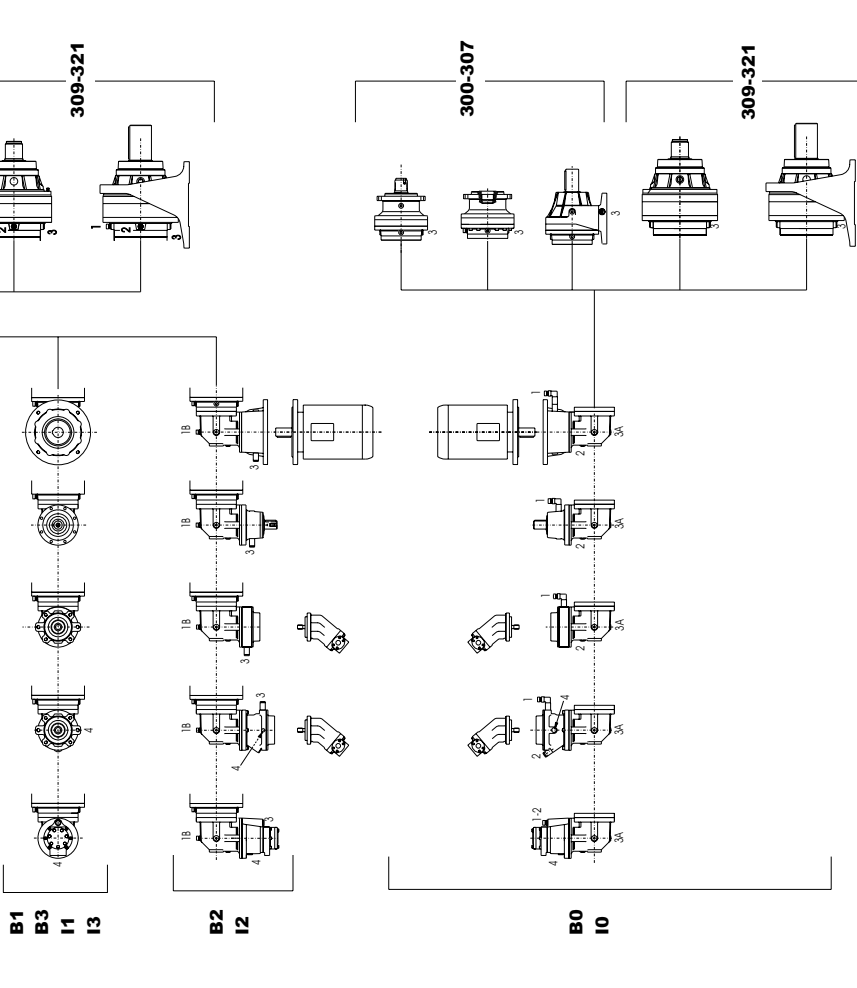
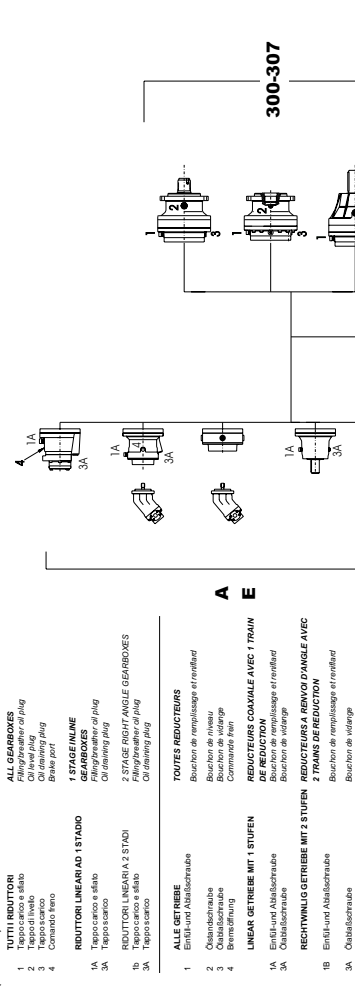
POSIZIONE TAPPI OLIO

PLUG POSITIONS

POSITION DER SCHRAUBEN

POSITIONS DES BOUCHONS

(FIG.32)



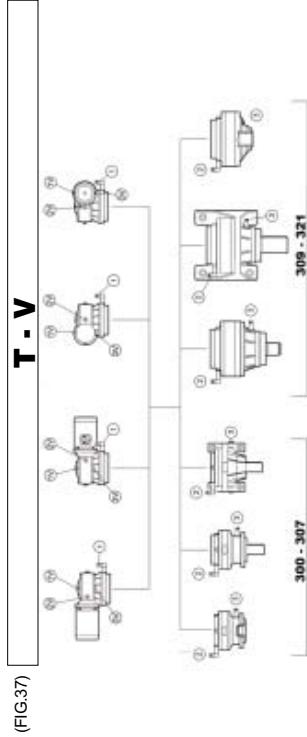
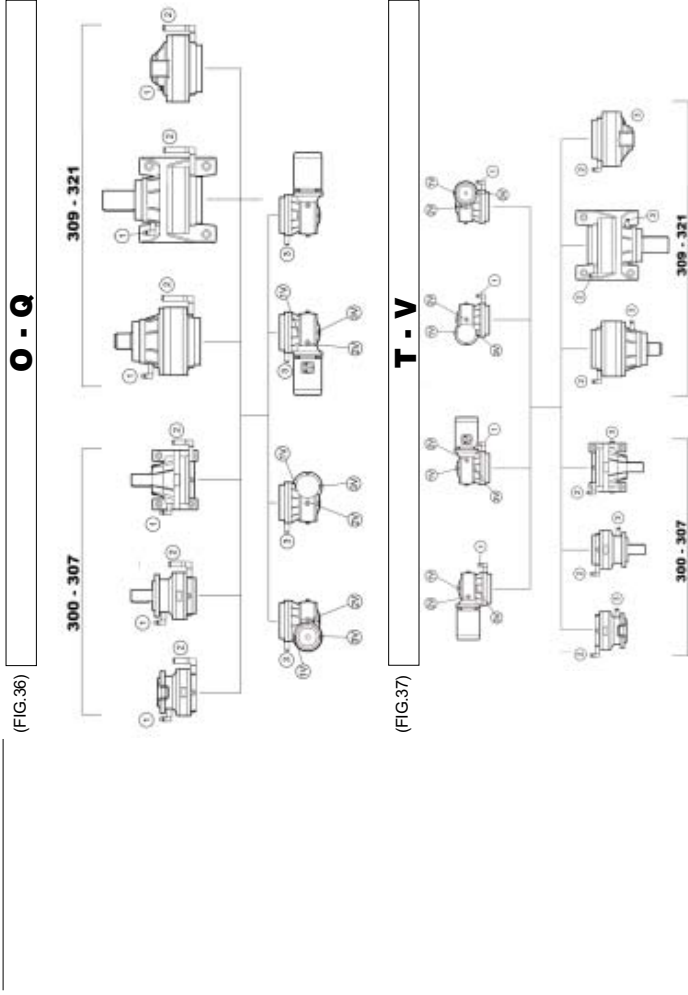
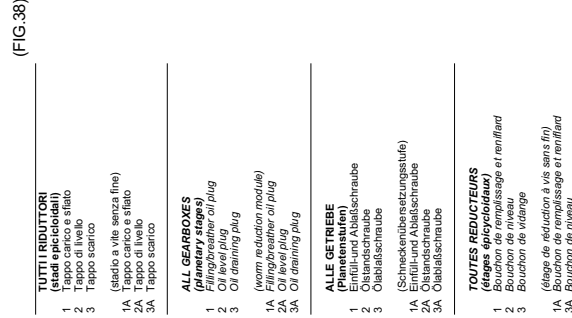
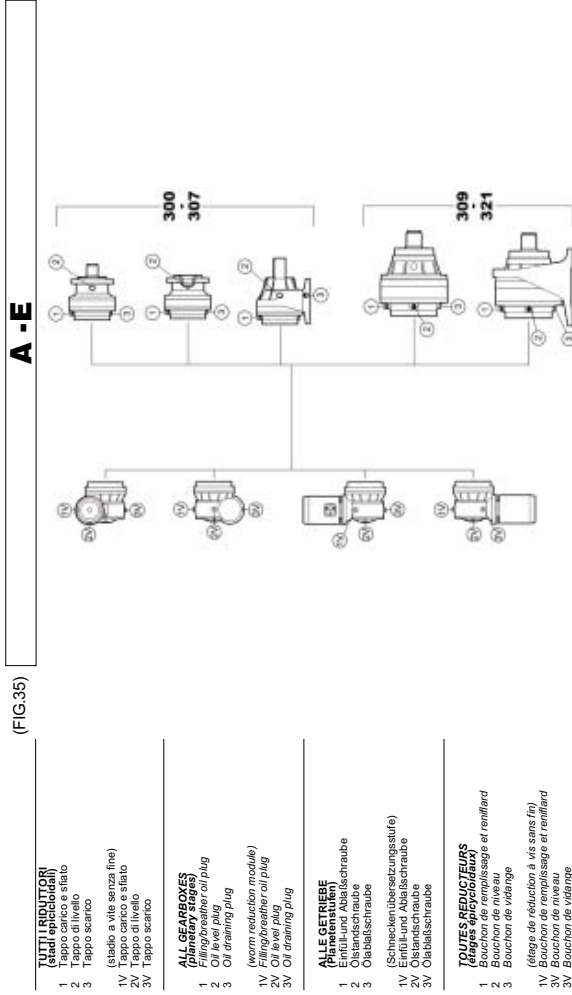
POSIZIONE TAPPI OLIO	PLUG POSITIONS	POSITION DER SCHRAUBEN	POSITIONS DES BOUCHONS
Serie 3NF	3NF Series	Serie 3NF	Série 3NF

POSIZIONE TAPPI OLIO
Serie 3/A

POS
Series

POSITIONS DES BOUCHONS

Série 3/A



QUANTITÀ OLIO (l)
Serie 3_L e 3_R

OIL QUANTITY (l)
3_L and 3_R Series

SCHMIEROLMENGE (l)
Serie 3_L und 3_R

QUANTITÉ D'HUILE (l)
Série 3_L et 3_R

3_L		3_R	
Tipo/Type Typ/Type	Posizione di montaggio Mounting position Einbaulagen Position de montage		Posizione di montaggio Mounting position Einbaulagen Position de montage
	A	T	O
300	L1	0,6	1,0
	L2	0,9	1,3
	L3	1,2	1,6
	L4	1,5	1,9
301	L1	0,8	1,2
	L2	1,1	1,5
	L3	1,4	1,8
	L4	1,7	2,1
303	L1	1,3	2,3
	L2	1,6	2,6
	L3	1,9	2,9
	L4	2,2	3,2
305	L1	1,6	2,6
	L2	2,1	3,1
	L3	2,4	3,4
	L4	2,7	3,7
306	L1	2,5	3,5
	L2	3,3	4,3
	L3	3,6	4,6
	L4	3,9	4,9
307	L1	3,5	5,0
	L2	4,5	6,0
	L3	5,0	6,5
	L4	5,3	6,8
309	L1	4,0	5,5
	L2	5,0	6,5
	L3	5,5	7,0
	L4	5,8	7,3
310	L1	5,0	6,5
	L2	6,3	7,8
	L3	7,1	8,6
	L4	7,4	8,9
311	L1	7,0	12,0
	L2	9,0	14,0
	L3	10,0	15,0
	L4	10,5	15,5
313	L1	9,0	14,0
	L2	11,5	16,5
	L3	12,5	17,5
	L4	13,0	18,0
315	L1	15,0	23,0
	L2	19,0	27,0
	L3	21,0	29,0
	L4	22,0	30,0
317	L1	20,0	35,0
	L2	26,0	41,0
	L3	30,0	45,0
	L4	35,0	48,0
319	L1	25,0	45,0
	L2	35,0	55,0
	L3	40,0	60,0
	L4	43,0	63,0
321	L1	30,0	50,0
	L2	45,0	65,0
	L3	51,0	71,0
	L4	55,0	75,0
VK		VK	
Posizione di montaggio Mounting position Einbaulagen Position de montage		Posizione di montaggio Mounting position Einbaulagen Position de montage	
BO		U	
R2		P	
300	R2	1,2	1,7
	R3	1,5	2,0
	R4	1,8	2,3
	R4	2,3	2,1
301	R2	1,6	2,1
	R3	1,9	2,4
	R4	2,2	2,7
	R4	2,5	2,5
303	R2	2,2	2,8
	R3	2,5	3,1
	R4	2,8	3,4
	R4	3,2	3,9
305	R2	2,5	3,1
	R3	3,0	3,6
	R4	3,3	3,9
	R4	3,7	4,4
306	R2	4,0	5,0
	R3	4,8	5,8
	R4	5,1	5,9
	R4	5,6	7,1
307	R2	6,0	8,0
	R3	7,0	9,0
	R4	7,5	9,5
	R4	8,5	10,5
309	R2	6,5	8,5
	R3	7,5	9,5
	R4	8,0	10,0
	R4	9,0	11,0
310	R3	11,0	13,0
	R4	12,0	14,0
	R4	13,0	16,0
	R4	16,0	21,0
311	R2	14,0	19,0
	R3	16,0	21,0
	R4	17,0	22,0
	R4	20,0	25,0
313	R2	16,0	21,0
	R3	19,0	24,0
	R4	20,0	25,0
	R4	23,0	28,0
315	R3	27,0	35,0
	R4	30,0	38,0
	R4	31,0	38,0
	R4	34,0	41,0
317	R3	38,0	52,0
	R4	42,0	56,0
	R4	52,0	68,0
	R4	56,0	75,0
319	R3	45,0	63,0
	R4	55,0	75,0
	R4	63,0	85,0
	R4	75,0	100,0
321	R3	51,0	71,0
	R4	64,0	88,0
	R4	71,0	95,0
	R4	88,0	115,0

N.B. Le quantità d'olio sono indicative. Verificare l'esatto livello al momento del riempimento tramite l'apposito tappo.

N.B. Oil quantities are indicative. Check actual level after filling through the appropriate plug.

N.B. Les quantités d'huile sont indicatives. Vérifiez la quantité correcte de lubrifiant selon le niveau d'huile.

Achtung! Die Angabe bezüglich Ölmenge sind Richtwerte. Der Ölstand soll während des Einfüllens anhand des Ölstandstopfens überprüft werden.

QUANTITÀ OLIO (l)
Serie 3VF - 3/A

OIL QUANTITY (l)
3VF - 3/A Series

SCHMIEROLMENGE (l)
Serie 3VF - 3/A

QUANTITÉ D'HUILE (l)
Série 3VF - 3/A

Tipo Type Type	Posizioni di montaggio / Mounting positions / Einbaulagen / Positions de montage					
	Entrata Input Entrée	AA-EA- FD	(B3)	AF-EF- FE	AE-EF- FF	AD-ED- FA
3/VF 00L3	0,90	0,90	0,12	0,90	0,12	0,90
	1,10	1,10	0,12	1,10	0,12	1,10
	1,60	1,60	0,32	1,60	0,32	1,60
	2,10	2,10	0,50	2,10	0,50	2,10
3/VF 05L3	3,30	3,30	0,87	3,30	0,87	3,30
	7,10	7,10	0,87	7,10	0,87	7,10
	7,10	7,10	0,87	7,10	0,87	7,10
	7,10	7,10	0,87	7,10	0,87	7,10
3/VF 07L3	HS	4,50	2,80	4,50	2,80	4,50
	HS	10,00	2,40	10,00	2,60	10,00
	P	12,50	2,60	12,50	2,60	12,50
	HS	5,00	4,50	5,00	3,90	5,00
3/VF 10L3	P	6,30	4,30	6,30	3,90	6,30
	HS	9,00	9,60	9,00	6,70	9,00
	P	11,50	7,80	11,50	6,70	11,50
	P	29,00	7,80	29,00	6,70	29,00
3/VF 15L3	HS	19,00	15,00	19,00	9,40	19,00
	P	40,00	11,00	40,00	9,40	40,00
	HS	26,00	28,00	26,00	16,80	26,00
	P	51,00	23,00	51,00	16,80	51,00
3/VF 19L4	HS	19,00	15,00	19,00	9,40	19,00
	P	40,00	11,00	40,00	9,40	40,00
	HS	26,00	28,00	26,00	16,80	26,00
	P	51,00	23,00	51,00	16,80	51,00
3/VF 21L4	HS	19,00	15,00	19,00	9,40	19,00
	P	40,00	11,00	40,00	9,40	40,00
	HS	26,00	28,00	26,00	16,80	26,00
	P	51,00	23,00	51,00	16,80	51,00

Stadi epicicloidali / planetary stages / Planetenstufen / étages épicycloïdaux

Stadio di riduzione a vite senza fine / worm reduction module / Schneckenübersetzungsstufe / étage de réduction à vis sans fin

Tipo Type Type	Posizioni di montaggio / Mounting positions / Einbaulagen / Positions de montage					
	AA-EA- FD	(B3)	TA-TE- VF-TD- VA-VC- VF-IO	OA-OE- OF-OD- QA-OE- QF-QD	AD-ED- FA	AE-EF- FE
3/A 00L2	0,60	1,30	1,00	1,30	0,60	1,30
	0,80	2,15	1,20	2,15	0,80	2,15
	1,30	2,95	2,30	2,95	1,30	2,95
	1,60	3,50	2,60	3,50	1,60	3,50
3/A 03L2	1,60	3,50	2,60	3,50	1,60	3,50
	2,50	4,60	3,50	4,60	2,50	4,60
	3,50	6,80	5,00	7,70	4,50	12,20
	3,50	6,80	5,00	7,70	4,50	12,20
3/A 05L2	1,60	3,50	2,60	3,50	1,60	3,50
	2,50	4,60	3,50	4,60	2,50	4,60
	3,50	6,80	5,00	7,70	4,50	12,20
	3,50	6,80	5,00	7,70	4,50	12,20
3/A 07L2	1,60	3,50	2,60	3,50	1,60	3,50
	2,50	4,60	3,50	4,60	2,50	4,60
	3,50	6,80	5,00	7,70	4,50	12,20
	3,50	6,80	5,00	7,70	4,50	12,20

Stadio epicicloidale / planetary stage / Planetenstufe / étage épicycloïdal

Stadio di riduzione ad assi ortogonali / Helical bevel reduction module / Kegelarübersetzungsstufe / étage de réduction à axes orthogonaux

Lubrificazione permanente

Life lubricated

Dauerschmierung

Lubrification permanente

NOTA: nei riduttori e motori combinati la lubrificazione degli stadi epicicloidali è separata da quella dei riduttori a vite senza fine (3VF) o elical bevel gears (3/A).

REMARQUE: Sur les réducteurs et moteurs combinés, la lubrification des étages épicycloïdaux est séparée de celle des réducteurs à vis sans fin (3VF) ou orthogonaux (3/A).

5 - MESSA IN FUNZIONE	5 - START-UP	5 - INBETRIEBNAHME	5 - MISE EN ROUTE	6 - MANUTENZIONE	6 - MAINTENANCE	6 - WARTUNG	6 - ENTRETIEN
<p>Prima di avviare il riduttore controllare:</p> <ul style="list-style-type: none">- Esatto posizionamento tappi olio.- Tappo sfiato che non sia ostruito da sporcizia o vernice. La sua chiusura provoca sovrappressione all'interno del riduttore con conseguente espulsione degli anelli di tenuta.- Avviare il riduttore possibilmente senza carico e quando è possibile a bassa velocità.- Verificare che il funzionamento sia regolare ed in assenza di eccessiva rumorosità. <p>Dopo le prime ore di esercizio verificare:</p> <ul style="list-style-type: none">- Temperatura sulla carcassa, questa non deve superare nel punto più caldo i 70-75°C.- Esatto serraggio viti.	<p>Before starting the gearbox, check the exact position of the oil plug and check that the breather is not blocked by dirt or paint.</p> <p>If the breather is blocked, pressure can build up inside the gearbox and blow out the seal rings.</p> <p>If possible, start up the gearbox without load and at low speed.</p> <p>Check that the gearbox runs smoothly and does not generate excessive noise;</p> <p>After the first few hours operation, check the temperature of the gearbox casing.</p> <p>At its hottest point it should not exceed 70°-75°C.</p> <p>Also check that all bolts are tight.</p>	<p>Von Inbetriebnahme des Getriebes folgendes kontrollieren:</p> <ul style="list-style-type: none">- Korrekte Position des Ölstopfens.- Entlüftungsstopfen darf nicht von Schmutz oder Lack verstopft sein. Ist er geschlossen, dann führt dies zu Überdruck im Getriebe und die Dichtringe lösen sich.- Das Getriebe möglichst ohne Last und, falls möglich, mit geringer Geschwindigkeit anfahren.- Kontrollieren, ob der Betrieb gleichmäßig und ohne Störgeräusche erfolgt. <p>Nach den ersten Betriebsstunden:</p> <ul style="list-style-type: none">- Temperatur am Gehäuse prüfen: sie darf an der heißesten Stelle 70-75°C nicht überschreiten.- Prüfen ob alle Schrauben gut angezogen sind.	<p>Avant la mise en route, vérifier:</p> <ul style="list-style-type: none">- La position exacte des bouchons.- Que le bouchon reniflard ne soit pas obstrué par des impuretés ou de la peinture. Son obstruction provoque une surpression à l'intérieur du réducteur avec pour conséquence l'extrusion des bagues d'étanchéité.- Procéder au démarrage du réducteur si possible à vide et éventuellement à basse vitesse.- Vérifier que le fonctionnement est normal et sans bruit excessif. <p>Après les premières heures de fonctionnement, vérifier:</p> <ul style="list-style-type: none">- La température sur le carter - celle-ci ne doit pas dépasser au point le plus chaud 70-75°C.- Le bon serrage des vis.	<p>In condizioni di normale esercizio il riduttore non necessita di manutenzione.</p> <p>Sono solo da effettuare le normali verifiche di livello e cambio olio come segue:</p> <p>Cambio olio</p> <p>Effettuare il primo cambio olio circa dopo 100÷150 ore di lavoro.</p> <p>Successivamente effettuare il cambio ogni 2000÷3000 ore a seconda degli impieghi o almeno una volta all'anno.</p> <p>È buona norma comunque controllare il livello una volta al mese per funzionamento intermittente, più frequentemente per funzionamento continuo e agguagliare olio se necessario.</p> <p>Nota: è sempre opportuno procedere al cambio degli anelli di tenuta, quando:</p> <ul style="list-style-type: none">- l'anello di tenuta viene smontato;- quando si fa una revisione del riduttore,- riposizionare l'anello di tenuta in modo che il labbro di tenuta del nuovo anello non lavori sulla stessa pista di scorrimento dell'anello precedente. <p>Note: se il riduttore dovesse rimanere fermo per lunghi periodi si consiglia di riempirlo completamente di olio che sarà riportato al giusto livello quando questo verrà rimesso in esercizio.</p>	<p>Gearboxes are virtually maintenance free under normal operating conditions. The only periodic operations required are checks on oil level and oil changes as follows:</p> <p>Oil Changes</p> <p>Change the oil first after 100-150 hours operation. Subsequently, change the oil only every 2000-3000 hours operation depending on application. Alternatively change oil once a year.</p> <p>Check the oil level in the gearbox every month and top up as necessary.</p> <p>Note: We recommend that you also change the oil seals on the following occasions:</p> <ul style="list-style-type: none">- whenever the seal rings are removed;- whenever the gearbox is serviced/reconditioned;- at least once a year with electric motor drives. <p>When fitting new seals, avoid locating the lip of the new seal in exactly the same place as that of the old seal.</p> <p>Note: Fill a gearbox completely with oil before any long idle period. Drain to the normal level prior to re-starting operation.</p>	<p>Unter normalen Betriebsbedingungen bedarf das Getriebe keiner Wartung. Nur der Ölstand sollte regelmäßig geprüft und das Öl muss gewechselt werden:</p> <p>Ölwechsel</p> <p>Den ersten Ölwechsel nach ca. 100-150 Betriebsstunden vornehmen, dann alle 2000 bis 300 Betriebsstunden je nach Einsatz, oder mindestens einmal im Jahr. Es empfiehlt sich, die Ölstand einmal im Monat zu kontrollieren und, falls nötig, nachzufüllen.</p> <p>Anmerkung: Es ist stets empfehlenswert, die Dichtringe auszutauschen, wenn:</p> <ul style="list-style-type: none">- der Dichttring ausgebaut wird- wenn das Getriebe überholt wird- bei Antrieb mit Elektromotor mindestens einmal jährlich. <p>Den Dichttring so einsetzen, daß die Dichtlippe des neuen Rings nicht an der gleichen Stelle ansetzt, wie jene des alten Rings.</p> <p>Anmerkung: Sollte das Getriebe über längere Zeiträume stehen, dann wird empfohlen, es vollständig mit Öl zu füllen und den korrekten Füllstand erst bei erneuter Inbetriebnahme wiederherzustellen.</p>	<p>Dans les conditions normales d'utilisation le réducteur ne nécessite pas d'entretien. Seul sont à effectuer les contrôles habituels de niveau et la vidange de l'huile comme suit:</p> <p>Vidange d'huile</p> <p>Effectuer la première vidange après 100/150 heures de travail environ.</p> <p>Puis successivement toutes les 2000-3000 heures selon le type d'utilisation ou au minimum une fois l'an.</p> <p>Il est toutefois conseillé de contrôler le niveau une fois par mois et faire l'appoint d'huile si nécessaire.</p> <p>Remarque: Il est toujours opportun de procéder au changement des joints d'étanchéité, lorsque:</p> <ul style="list-style-type: none">- Le joint a été démonté.- On procède à une révision du réducteur. <p>Remplacer le nouveau joint de façon que les bords ne travaillent pas sur la même piste de glissement que le joint précédent.</p> <p>Remarque: Si par nécessité le réducteur devait rester arrêté pour de longues périodes, il est conseillé de remplir complètement d'huile. La mise à niveau sera effectuée lors de la remise en route du réducteur.</p>

PRECARICO E MOMENTO DI SERRAGGIO PER VITI CON FILETTATURA ISO A PASSO GROSSO Il precarico è stato calcolato pari al 70% del carico di snervamento minimo. Il momento torcente è stato calcolato impiegando la formula (39) del manuale Junker & Blume, ed attribuendo al coefficiente di attrito μ ges il valore medio ges 0,14.	\varnothing nom. vite \varnothing nom. screw \varnothing Güte Klasse Diam. nom. vis	Precarico max V (daN) Max preloading V (daN) Beanspruchbarkeit max. (daN) Précharge max V (daN)			Momento max Ma (daNm) Max torque Ma (daNm) Anzugsmoment max (daNm) Couple max Ma (daNm)		
		8.8 8 G	10.9 10 K	12.9 12 K	8.8 8 G	10.9 10 K	12.9 12 K
		M 4x0,7	394	554	665	0,31	0,43
PRELOADING AND TIGHTENING TORQUE FOR ISO STD. PITCH SCREWS Preloading has been calculated at 70% of the yield point. Formula (39) of the Junker and Blume's handbook has been used to calculate the torque, and a mean value of μ ges 0,14 has been given to friction coefficient μ ges.	M 5x0,8	635	895	1070	0,60	0,84	1,01
	M 6x1	902	1270	1520	1,03	1,46	1,75
	M 8x1,25	1640	2310	2770	2,48	3,49	4,19
	M 10x1,5	2600	3660	4380	4,97	7,0	8,37
	M 12x1,75	3780	5320	6380	8,46	11,9	14,30
	M 14x2	5160	7250	8700	13,46	18,92	22,70
	M 16x2	7020	9900	11000	20,40	28,80	34,60
BEANSPRUCHBARKEIT UND ANZUGSMOMENT DER SCHRAUBEN MIT HOHER GEWINDESTEHUNG GEM. ISO Die Beanspruchbarkeitswerte betragen 70% der min. Bruchbelastung. Das Anzugsmoment wurde gemäß Formel 39 des Junker und Blume Manuels errechnet unter Berücksichtigung eines Reibungskoeffizienten von μ ges-0,14 (Mittelwert).	M 18x2,5	8600	12100	14500	28,40	40,0	48,0
	M 20x2,5	11000	15540	18500	39,6	55,60	66,60
	M 22x2,5	13600	19100	22900	53	74,5	90
	M 24x3	15900	22300	26700	70	98	117
	M 27x3	20600	28900	34700	101	142	170
	M 30x3,5	26000	36000	44000	142	200	235
PRÉCHARGE ET COUPLE DE SERRAGE POUR VIS A FILETAGE ISO PAS GROS. La précharge a été calculée à 70% de la charge minimum de rupture. Le moment de torsion a été calculé par la formule (39) du manuel Junker et Blume, en attribuant au coefficient de frottement μ ges la valeur moyenne 0,14.							

INDICE DELLE REVISIONI (R) INDEX OF REVISIONS (R) LISTE DER ÄNDERUNGEN (R) INDEX DES RÉVISIONS (R)

R0

Questa pubblicazione annulla e sostituisce ogni precedente edizione o revisione. Ci riserviamo il diritto di apportare modifiche senza preavviso. E' vietata la riproduzione anche parziale senza autorizzazione.

This publication cancels and replaces any previous edition and revision. We reserve the right to implement modifications without notice. This catalogue cannot be reproduced, even partially, without prior consent.

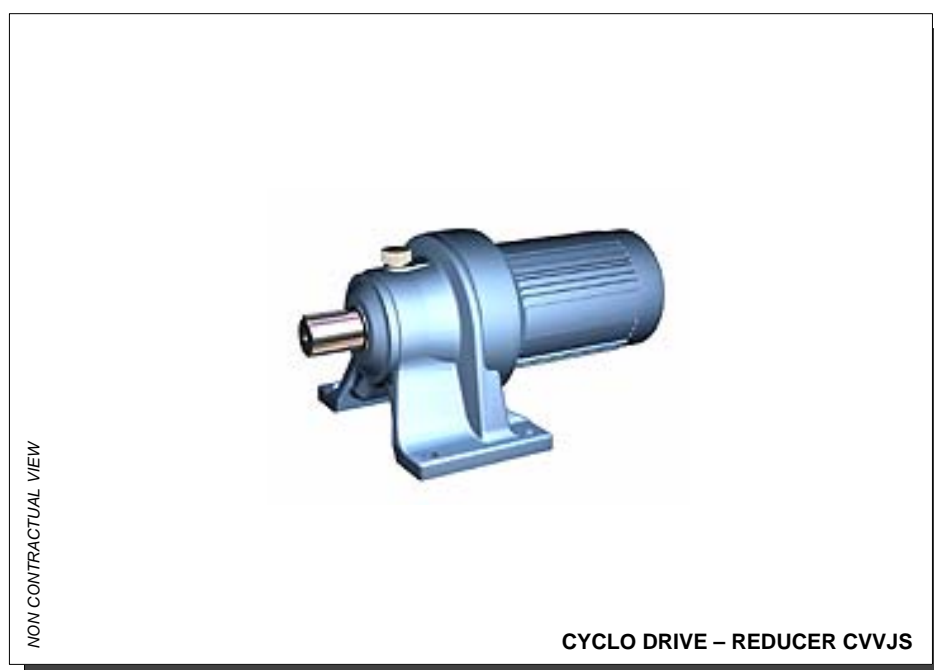
Diese Veröffentlichung annulliert und ersetzt jeder hergehende Edition oder Revision. BONFIGLIO behält sich das Recht vor, Änderungen ohne vorherige Informationen durchzuführen.

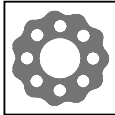
Cette publication annule et remplace toutes les autres précédentes. Nous nous réservons le droit d'apporter toutes modifications à nos produits. La reproduction et la publication partielle ou totale de ce catalogue est interdite sans a autorisation.

4.15 REDUCER CVVJS 6145

Location	ECL Code	Reducer reference	Position
(x1) Tapping tool / Hook rotation	1-10-047-23	CVVJS 6145 DBE 649/G	VA – Vertical

The following document is an extract of the supplier manual





DRIVE 6000

Gear and Gearmotor

Operating Manual

DRIVE 6000

N°
991034
03/03

SUMITOMO CYCLO EUROPE

DRIVE 6000 Operating Manual

SUMITOMO CYCLO EUROPE

Copyright 2002 All rights reserved
Reproduction in part or whole is not permitted without our prior approval.
Whilst every care has been taken in preparation of this manual, no liability can be accepted for any errors or omissions.
Subject to technical changes.

Content:

1.	General information	2
2.	Safety advice	2
3.	Transportation	2
4.	Connection of other transmission components	3
5.	Gear/gearmotor Installation	3
5.1	Necessary tools	3
5.2	Assembly tolerances	3
5.3	To check before installation	4
5.4	Getting the unit ready for installation	4
5.5	Installation of the CYCLO DRIVE	4
6.	Electrical connection	5
6.1	Safety advise	5
6.2	Range of use	5
6.3	Installation	5
6.4	Cable inlet thread sizes	6
6.5	Electrical connection	6
6.6	Brake motors	7
6.7	Installation with frequency inverters	7
6.8	Motor protection	7
6.9	Forced ventilator	8
7.	Start up	8
8.	Lubrication	9
8.1	Grease lubrication	9
8.1.1	Lifetime grease lubrication	9
8.1.2	Grease lubrication	9
8.2	Oil lubrication	10
8.2.1	Type of oil lubrication	10
8.2.1.1	Horizontal mounting	10
8.2.1.2	Vertical mounting	11
8.2.2	Recommended oil type	12
8.2.3	Oil quantity	12
8.2.4	Oil change intervals	13
9.	Inspection and maintenance	13
9.1	Grease refill	13
9.2	Oil level check	14
9.3	Oil check	14
9.4	Oil change	15
10.	Troubleshooting	16

1. General information

Please observe the following warnings



Electrical hazard

Misapplication of the machine may be dangerous, risk of severe or fatal injury.



Imminent danger

Misapplication of the machine may be dangerous and lead to severe injuries.



Dangerous situation

Risk of physical injury



Damaging situation

Risk of machine damage.



Helpful information



Disposal

Please observe legal / environmental regulations.

2. Safety advice



Do not attempt to install or operate the CYCLO DRIVE until all of these instructions on assembly, operation, maintenance and inspection and hazards are read and thoroughly understood. Please keep these instructions next to the unit in operation to check at any time when necessary.



Transportation, assembly, lubrication, operation, maintenance and inspection should only be done by qualified personnel, so as to avoid personal injury or damage to property. Do not touch moving mechanical components and make sure these parts are clear of obstructions. Failure to follow these instructions may result in personal injury, unit failure or damage to property.

Only operate the unit in the application it was intended. Misapplication may result in physical injury or damage to machinery.

3. Transportation recommendations



The units must be checked for any transportation damage immediately upon receipt. Any damages should be reported to the carrier without delay. If there is any evidence of damage which may put at risk the function of the CYCLO DRIVE, do not install the unit.



Lifting harnesses of suitable and adequate size are to be used; these are to be hooked into the eye bolts or laid round the flange connections. Eye bolts on the gearbox are dimensioned for the weight of the unit, no additional loads are allowed.



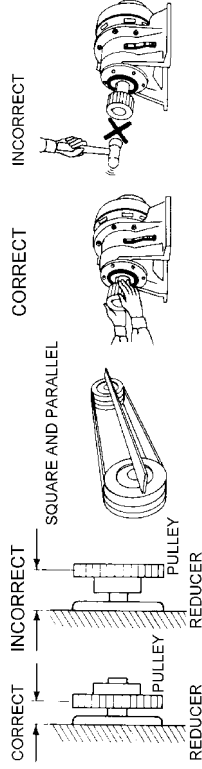
Caution: do not use the central bores in the shaft ends for lifting the drive with hooked bolts, etc. This could result in damage to the bearings.

4. Connection of other transmission components

Assembly is carried out using the central bores in the ends of the shaft or by heating the parts to be mounted to a maximum of 100°C. The shafts have been fitted with keyways to DIN 6885, sheet 1. Bores of the parts to be fitted on the shafts should be according to the tolerances given in the respective catalogue. A locking screw or similar is to be used to prevent any axial movement. Chainwheels, discs or gear wheels must be located as close to the bearing as possible (see illustration below to keep the radial loads as small as possible). If pinions or chains etc. are used, the drive should be installed so that the unit location fastening act against the applied radial load. In the case of speed reducers with hollow high speed shafts, MoS₂ paste or spray (e.g. Molykote) is to be applied to the motor shaft before it is connected.



It is the responsibility of the user to provide guards for all exposed input and output components such as pulley, couplings, etc.!



Clutches, discs, gear wheels, chains, etc. should be mounted on the reducer shafts carefully. Do not force them onto the shafts as this could damage the gearbox bearings.

5. Gear or gearmotor installation

5.1 Necessary tools

- Screw wrench set
- Torque wrench for fastening screws on foot or flange housing, motor adaptor, clamp coupling, etc.
- Pulling on device
- Mounting shims
- Corrosive protection (e.g. MoS₂-Paste)



5.2 Assembly tolerances for gear or gearmotor

Shafts	Flanges	
Input shaft	k6 for Ø < 30 mm	Centering shoulder tolerances according to DIN 42948
Output shaft	h6 for Ø ≥ 30 mm	IEC-Input flange H8
High speed hollow shaft	k6 for Ø ≤ 50 mm	Output flange j6 up to size 612
Centre boring according to DIN 332, Form DR F7	h6 for Ø > 50 mm	V type f8 size 613 and larger
		Casing F-Type g6



5.3 Please check before installation



- Data on name plate matches with other documents such as drawings, parts list, etc.
- In case of gearmotor, check if power is up to the motor requirements
- Inspect the gearbox for possible damage.
- Provide the recommended lubricants according to the environment of the installation.

5.4 Before starting up



The anti-corrosive agent (Valvoline Tectyl 846/K19) used for transportation and storage on the shaft-ends or hollow shafts, and on the central seats must be removed before start up. This anti-corrosive agent can be removed using an alkaline detergent; under no circumstances is it to be removed mechanically (abrasive etc.). The alkaline detergent must not come into contact with the seals.



When handling lubricants and anti-corrosive agents please observe the respective safety instructions for people and environment according to DIN 52 900.

5.5 Installation

The drive should be installed so that it is easily accessible for any future lubrication or grease top-up.



First establish a perfect level, using a non-distorting and vibration- absorbing base for the complete mounting area, and align the drive before tightening the fastening screws. Check all fastening screws for correct torque after about 4 weeks. Dowel pins (e.g. DIN 6325 cylinder pins) are to be used in addition to the base fastening with screws of property class 8.8 or greater if the drive is being driven to the maximum output torque or maximum radial load.



Units to be installed outdoors or in very unfavourable ambient conditions, e.g. dirt, dust, spray water or heat, should be protected by covers. Free air access to the housing surface must not be impaired under these circumstances.

Oil level, drain plug and breathing filter must also be clear for access.



In case of electrochemical corrosion risk due to contact of different metals such as cast iron and fine steel, plastic protection of 2 or 3 mm thick should go between gear and machine. Screws should also be protected by plastic discs. In addition, protect the housing with earthing screws fixed to the motor.



Special corrosive protected units are available for installation in wet conditions.

When re-painting the unit, please cover carefully the breather and the shaft seals. Remove any covering after the painting has been finished.

6. Electrical installation

6.1 Safety advice

Installation, start up and servicing should only be done by qualified personnel.



Before commencing upon the servicing of the motor or the gearmotor, particularly before opening covers to active parts, the main electrical supply must be discounted. Please follow the five safety rules according to DIN VDE 0105.. The motors comply with the low voltage directives 73/23/EWG..

6.2 Range of application



The motors are totally enclosed fan cooled. Standard protection is IP55, and with brake IP 44. Ambient temperature: -10° ... +40°C Ground level: ≤ 1000 m



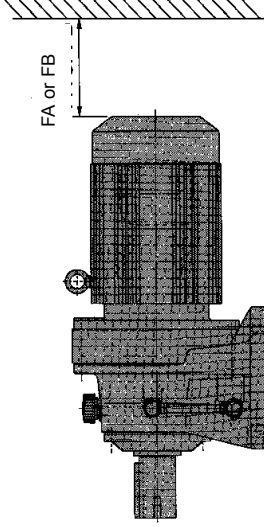
Winding is insulation class F (+150°C). It is normal for the reducer to operate at a housing temperature of up to +100°C. Therefore, any contact with them must be prevented. Temperature sensitive parts must never be fastened to or be in contact with the motor.

6.3 Installation



Ventilation openings must be kept clear.

For correct cooling the distance FB is the minimum required between the fan cover and the wall. FA is the minimum clearance required for disassembling the fan cover.



Standard Motor

Motor Size:	63 - 71	80	90	100	112-132S	132M-160M	160L	180M	180L	220
FB (mm):	20	20	20	20	20	25	30	30	30	30
FA (mm):	48	49	52	56	60	75	130	155	170	230

Brake Motor

Motor Size:	63 - 71	80	90	100	112-132S	132M-160M	160L	180M	180L	220
FB (mm):	20	20	20	20	25	25	30	30	30	30
FA (mm):	61	93	115	121	132	170	220	367	370	445

6.4 Cable inlet threads sizes


The following thread sizes are suitable for the standard motors

Motor size	Pg	Metric
063 - 132 S	2 x Pg 16	2 x M 25 x 1,5
132M - 160	2 x Pg 21	2 x M 32 x 1,5
180 - 200	2 x Pg 42	2 x M 50 x 1,5

Cable glands suitable for the motor protection level must be used.
Any unused cable entries must be closed, to the correct motor protection level.

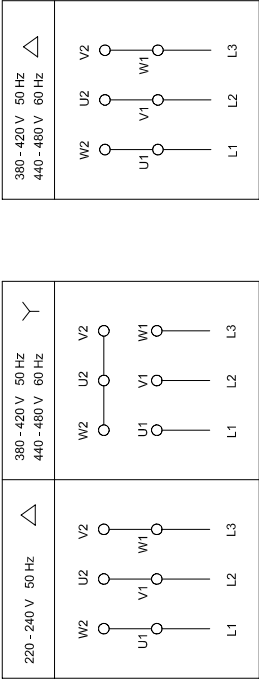
6.5 Electrical connection

For technical characteristics and allowable range of application please check rating plate, data given in this manual or in the catalogue. In case of special applications, the order acknowledgement will give further details. If you have any questions, please contact Sumitomo Cyclo Europe, indicating type of motor and serial number.

									
TYPE									
V		Hz							
A		n		1/min					
P		kW		IP					
I _{CL}		cos φ		°C					
B		Nm		K(T _{amb})					
VDE 0530				20525					

Connect ground wire to this terminal

The terminal box shows a circuit diagram. The motors should be connected at the terminal block according to the main power supply as follows



Rated operational voltage for the voltages above are according to DIN EN 60 034-1 with ± 5% tolerance.

Tightening torques for the terminal block bolts:
Connecting bolt thread tightening torque in Nm

M4	1,2
M5	2,5
M6	4,0
M8	7,5

6.6 Brake motor



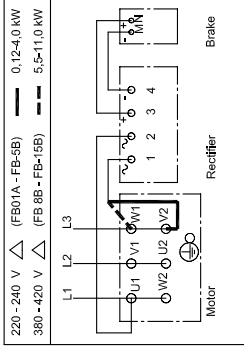
Connection of brake motors should be according to the following circuit diagrams.
The brake is already wired to the motor at delivery. For a separate power supply to the brake please disconnect the U1 - 2 and V2 - 1.
The control voltage for the brake is indicated at the rating plate.



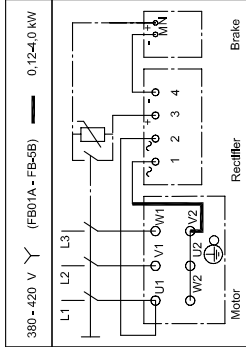
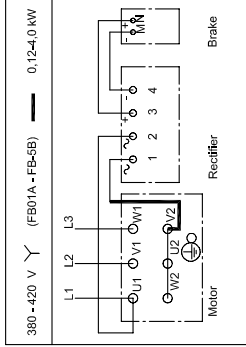
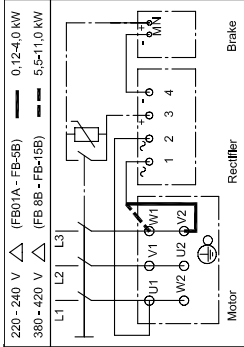
For a fast acting brake (de-switching) a separate cable to an external contact is necessary.
The contact must be protected with a varistor.



Standard brake



Fast acting brake



6.7 Installation with frequency inverter



For operating F-motors with a frequency inverter please follow EMC instructions of the frequency inverter.

Screened cable and metal cable glands are required.

The output torque of the motor depends on the type of frequency inverter in use.

The rectifier of the brake requires a separate power supply.

The motor must be protected against overheating by PTC resistor, thermal contacts or forced ventilation.

6.8 Motor protection



Motor protection switches (overload circuit breaker) must be adjusted to the current according to the voltage indicated at the rating plate.
Thermal contacts are break contacts (NC) as standard.
The resistance of PTC thermistors at 20°C can vary from 90 W to maximum 750 W.

DRIVE 6000 Operating Manual

SUMITOMO CYCLO EUROPE

6.9 Forced ventilator

Connect the forced ventilator at the terminal box located on the ventilator cover.

A separate power supply should be provided for the ventilator motor.

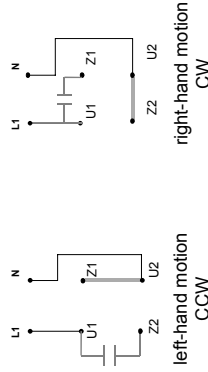
CAUTION: Depending on the control in use, the ventilator may be running even when the motor is at standstill.

Rating plates and circuit diagrams for forced ventilators are in the terminal box.

They vary according to the size. The ventilator motor can be configured as follows:

- Shaded pole motor: connection, L1 and N (reversal of rotation direction is not possible)

- Single phase motor:



- Three-phase-motor: Star-connection or delta-connection, depending on voltage as indicated in 6.5 electrical connection.

Note: Reversal of rotation inversion is made by inverting two phases.

7. Start up

Before starting the motor, check once again all safety instructions

Make sure that the power supply is in accordance with the characteristics indicated at the rating plate. For additional devices, e.g. heater, see more details in the terminal box.

Connection cable diameters must be selected according to the motor power.

Installation is subject to all regulations and must be done by qualified personnel.

Before starting the motor review all safety regulations, check if the unit is properly installed and aligned. Check all fastening parts and review if grounding is properly tightened. Also check additional devices for proper function and connections and in the case of a second shaft end, make sure that the key is secure.


If possible, start the gearmotor without load. If the gearmotor operates smoothly and without any strange noise, connect to the machine. During the initial run-in check the motor input current under load for possible over-current or phase asymmetry.

DRIVE 6000 Operating Manual

SUMITOMO CYCLO EUROPE

8. Lubrication

8.1 Grease lubrication

 Grease lubricated CYCLO DRIVES are filled with grease at the factory and are ready for use without refilling. The grease being used must not be mixed with other types of grease. The standard types of grease ESSO Unirex N2 (for lifetime lubrication) and Shell Aviania R2 are suitable for ambient temperatures of -10°C to +50°C, whereby self-heating of the units up to a maximum of +60°C can be achieved during constant operation. Please contact Sumitomo Cyclo Europe if considering use of standard grease outside this temperature range, as well as the use of other lubricants.

8.1.1 Lifetime grease lubrication

All CYCLO Drive 6000 units type CN.. are grease lubricated for life and can be mounted in any position required. The units are filled with ESSO Unirex N2 at the factory and do not require any refilling. The life can be increased if the grease is replaced after 20,000 hours or 4 to 5 years.

Grease quantity for grease change [q]

Size	606	607	608	609	610	611	612	606DA	607DA	609DA	610DA	612DA	612DB
1 st stage	25	25	65	90	140	200	330	25	25	25	25	25	90
2 nd stage								25	25	90	140	330	330
Output	35	35	70	100	100	90	120	35	35	100	100	120	120

8.1.2 Grease lubrication

CYCLO DRIVE 6000 lubricated with Shell Alvania R2 must be topped up after 500 operating hours, or after 2 months in operation at the latest. Further top up is recommended every 2 or 3 months, or after 2 years in operation at the latest.

Increase quantities for top up (g)

[illegible]

Size	618DA	618DB	619DA	619DB	620DA	620DB	621DA	621DB	622DA	622DB
1. stage	100	450	150	450	150	450	450	750	450	1000
2. stage	1100	1100	1500	1500	1500	1500	2000	2000	2500	2500
Output	600	600	700	700	700	700	800	800	900	900

Größe	623DA	623DB	624DA	624DB	625DA	625DB	626DA
1. stage	750	1100	750	1100	1000	1500	1500
2. stage	4000	4000	4500	4500	6000	6000	8000
Output	1000	1000	1100	1100	1200	1200	1300

Regreasing intervals

Operating conditions	Regreasing interval	Comments
up to 10 hours/day	every 3 - 6 months	regreasing intervals must be shortened in the case of use in difficult conditions
10 - 24 hours/day	every 500 - 1000 hours	

Grease change intervals

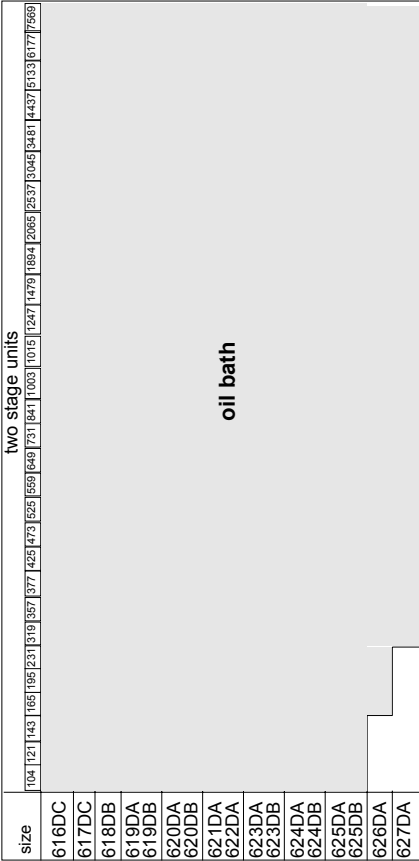
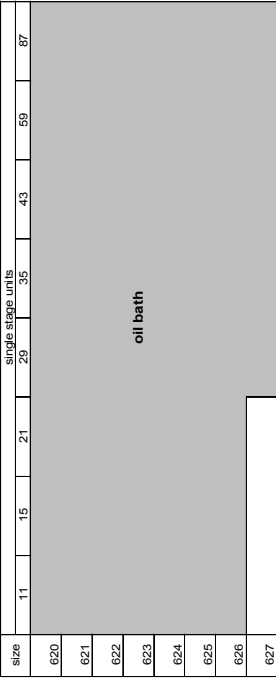
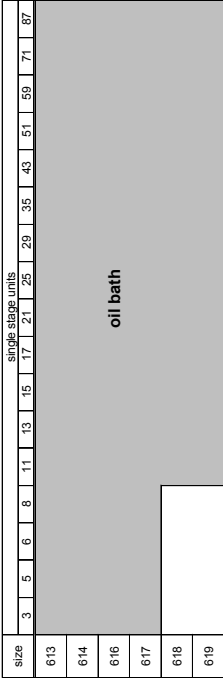
Section	Grease change intervals	Comments
High speed & speed reducer section	every 2 - 3 years	regreasing intervals must be shortened in the case of use in difficult conditions
Output	every 3 - 5 years	

Refilling and changing lubricants
CYCLO DRIVE 6000 from size 613 and larger, two-stage designs, are grease lubricated and are fitted with grease nipples for regular regreasing.

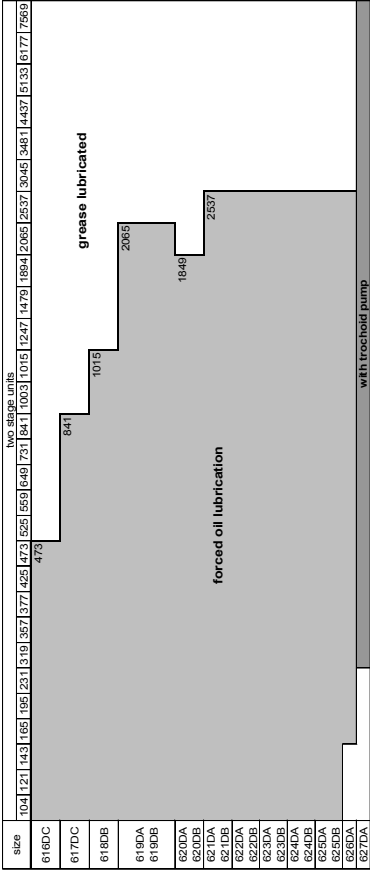
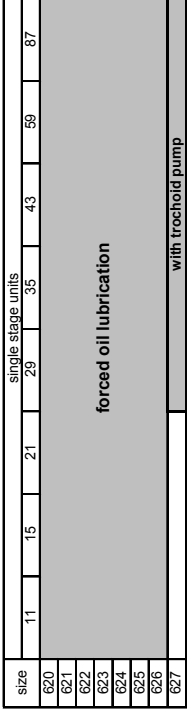
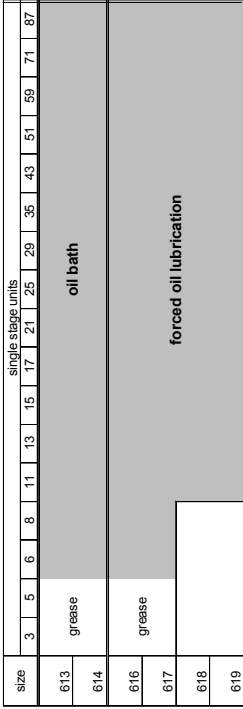
8.2 Oil lubrication

8.2.1 Type of oil lubrication

8.2.1.1 Horizontal mounting



8.2.1.2 Vertical mounting

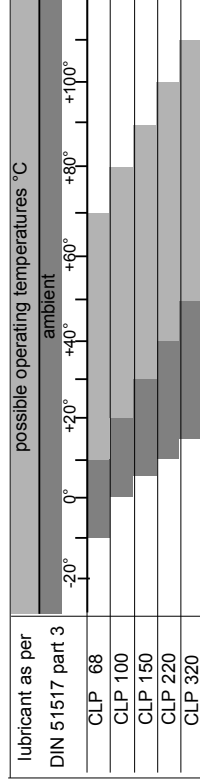


DRIVE 6000 Operating Manual

SUMITOMO CYCLO EUROPE

8.2.2 Recommended types of oil

All lubricant oils complying with the standard DIN 51517 part 3 are suitable. The correct viscosity class must be selected depending on the ambient and operating temperature according to standard DIN 51519.



Manufacturer	Type of oil	Manufacturer	Type of oil	Manufacturer	Type of oil
ARAL	Degol BG	DEA	Falcon C.I.P	MOBIL	Mobilgear
AVIA	Gear RSX	ELF	Reductoil SP	OPTIMOL	Ultra
BP	Energol GR-XP	ESSO	Spartan EP	SHELL	Omala
Castrol	Alpha MW	KLÜBER	Klüberoil GEM 1	TOTAL	Carter EP

8.2.3 Oil quantities



The quantities indicated are average recommendations. The actual quantity should be determined by the means of the oil level gauge.

CHH, CHX, CHV, CHY.															
size	613	614	616	617	618	619	620	621	622	623	624	625	626	627	
CH	0.7	0.7	1.4	1.9	2.5	4.0	5.5	6.5	10	15	16	21	26	56	
CHC	616C	617C	618C	619B	619D	619B	620A	620B	621A	621B	622A	622B	623B	623B	
CHV	1.5	2.4	3.5	3.5	5.8	6.0	6.0	6.0	10	10	11	17	17		
CHY	624A	624B	625A	625B	626A	627A									
CHV, CHY.	18	18	23	23	32	70									
size	613	614	616	617	618	619	620	621	622	623	624	625	626	627	
CH	1.1	1.1	1.0	1.9	2.0	2.7	5.7	7.5	10	12	15	42	51	60	
CHC	616C	617C	618C	619B	619D	619B	620A	620B	621A	621B	622A	622B	623A	623B	
CHV	1.0	1.9	2.0	2.0	2.7	2.7	11	11	14	14	16	18	23	23	
CHY	624A	624B	625A	625B	626A										
CHV, CHY.	29	29	42	42	51	60									
size	613	614	616	617	618	619	620	621	622	623	624	625	626	627	
CH	0.25	0.25	0.9	1.5	1.3	2	3	4	5	7.5	8	11	14	30	
CHC	616C	617C	618C	619B	619D	619B	620A	620B	621A	621B	622A	622B	623A	623B	
CHV	1.0	2.0	2.3	2.3	3.8	4.0	4.0	4.0	5.5	5.5	6.0	6.0	9.5	9.5	
CHY	624A	624B	625A	625B	626A	627A									
CHV, CHY.	10	10	13	13	17	40									

DRIVE 6000 Operating Manual

SUMITOMO CYCLO EUROPE

8.2.4 Oil change intervals

Oil level must be checked every 5,000 hours. If the oil is contaminated, burned or waxed, change the oil immediately, and flush the gear if necessary.

Under normal operating conditions oil should be changed every 10,000 hours or after 2 years at the latest. A shorter oil change (every 3000 or 5000 hours) will increase the gear lifetime.

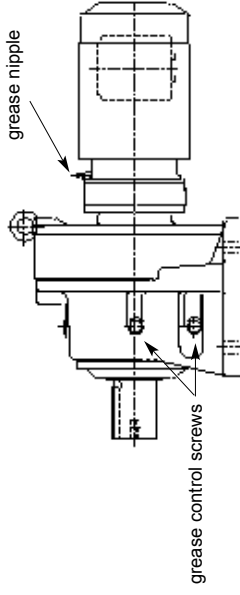
We recommend to change the oil after the first 500 hours of operation.

The recommendations above do not apply to abnormal operating conditions, i.e., high temperature, high humidity or corrosive environments. If any of these situations exist, the lubricant may have to be changed more frequently.

9. Inspection and maintenance

9.1 Re-greasing of grease lubricated gears

Unfasten the grease control screws and replenish with a grease gun through the grease nipple at the flange on the output part or the motor flange



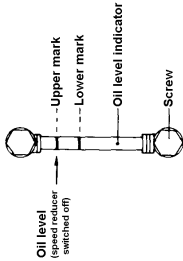
Continue re-greasing with the gear unit in operation to provide proper circulation of the grease.

For each re-greasing use about one third to half of the quantity shown by the graph in 8.1.2 stage 1. If too much grease is applied, the operating heat can lead to a rise in the lubricant temperature or grease might be forced into the motor or escape through the seals.

Remove grease residuals on the control screw and dispose of as required by environmental regulations.

9.2 Oil level check

The oil level can be checked by the oil level indicator

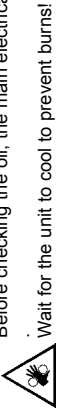


The oil level indicator is normally located on the right side of horizontal mounted gears, looking at it from the output flange. The indicator can be mounted left or right, therefore, choose the side which gives better visibility.

During operation, the lower marking at the oil level indicator shows the normal oil level. Immediately after starting the machine, the level may fall below the lower red marking. This is to be considered as normal, as the oil level increases when the viscosity of the oil reduces due to the normal operating temperature.

9.3 Oil check

Before checking the oil, the main electrical supply must be disconnected



Wait for the unit to cool to prevent burns!



Collect an oil sample at the oil drain.
Check oil condition and viscosity

If the oil is contaminated, change the oil even if the intervals according to 8.2.4 are not due.



Dispose of the oil sample according to environmental protection instructions.

9.4 Oil change

First, the main electrical supply must be disconnected.



Wait for the unit to cool to prevent burns!!



Change oil with the gear still warm, as this is beneficial for draining.

Place a collector under the oil drain.

Remove the oil level indicator, any breather plug, breathing valve and oil drain screw.

Drain oil completely.

Replace the oil drain plug and fasten it.

Fill with new oil according to the oil recommendations. In case you wish to use another oil type, please contact Sumitomo Cyclo Europe.

For oil quantities, see 8.2.3 "oil quantities".

Check oil level at the indicator.

Fasten oil breather.



Dispose of the oil according to environmental protection instructions.

DRIVE 6000 Operating Manual

SUMITOMO CYCLO EUROPE

10. Troubleshooting

Operating problem	Possible reasons	Trouble shooting
Unusual, constant running noise	1. Meshing/grinding noise: bearing damage 2. Knocking noise: irregularity in the reducer	1. Check oil (see inspection and maintenance) replace bearing 2. Contact customer service
Unusual, not constant running noise	Foreign substance in the oil	Check oil (see inspection & maintenance) Stop drive, contact customer service
Oil leakage 1) - from the gear cover - from the motor flange - from the motor shaft sealing - from the gear flange - from the output flange seal ring	1. Sealing at gear cover not functioning properly 2. Sealing damaged 3. Gear not vented	1. Tighten gear cover screws and observe the unit. If leakage continues, contact customer service 2. Contact customer service 3. Check oil breather
Oil leakage from the breather	Oil level too high - Incorrect mounting position - Repeated cold start (oil foams) and / or oil level too high	Adjust oil level (see 9.2) Check breather and oil level (see 9.2)
Slow speed shaft does not rotate while motor is running or high speed shaft is rotating	Shaft to collar connection interrupted	Return gear / gearmotor to Sumitomo Cyclo Europe for servicing

1) A small quantity of oil or grease leaking from the shaft seal ring is normal at the beginning of operation (24 hours of service), refer to DIN 3761.

4.16 REDUCER MC..

Location	ECL Code	Reducer reference	Position
(x1) 36T tapping tool ass'y	1-10-185-05	MC 3 PL SF 07	PL – Horizontal

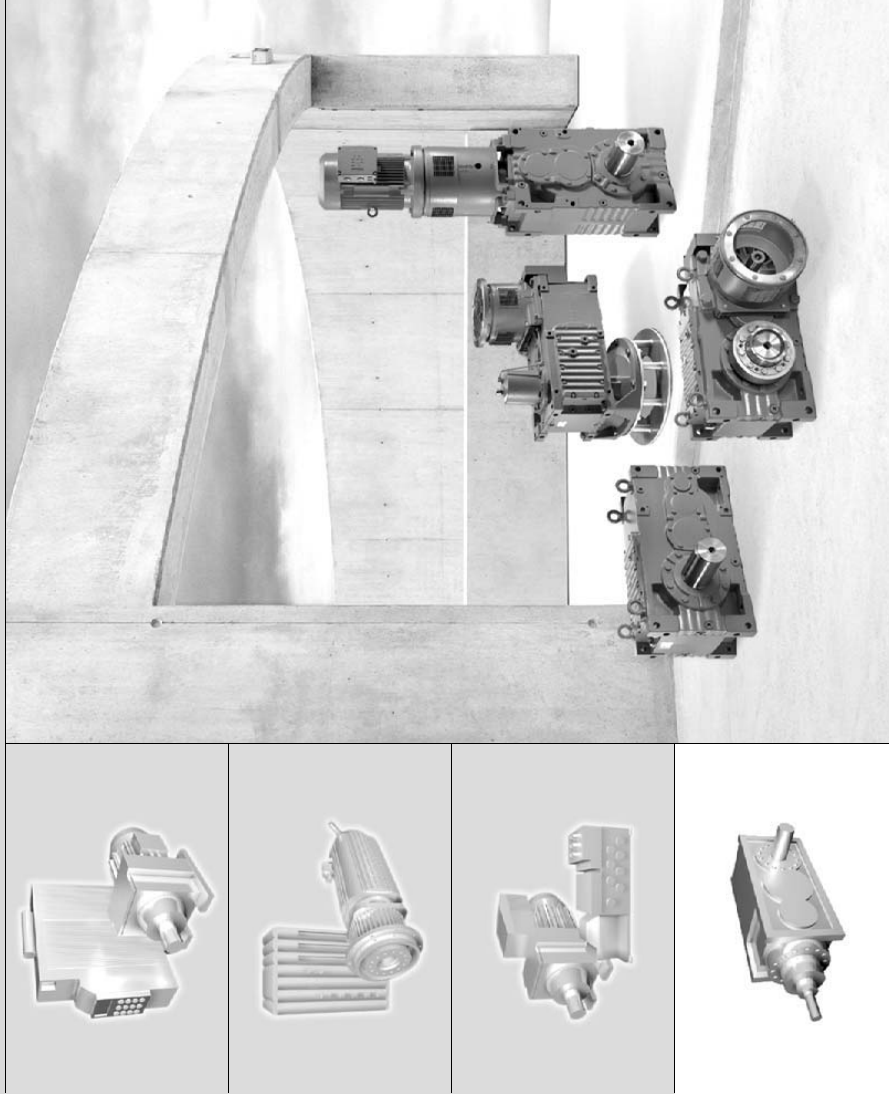


NON CONTRACTUAL VIEW

SEW – REDUCER TYPE MC



SEW
EURODRIVE



**Industrial Gear Units of the
MC.. Series**

GD110000

Edition 11/2005
11357614 / EN

Operating Instructions



SEW
EURODRIVE

1	Important information about the Operating Instructions	5
1.1	Important information and designated use.....	5
1.2	Explanation of symbols.....	6
1.3	Operating notes.....	6
2	Safety Notes	7
2.1	Preface.....	7
2.2	General information.....	7
2.3	Personal protective equipment.....	8
2.4	Transport of industrial gear units.....	9
2.5	Corrosion and surface protection.....	13
3	Gear Unit Design	17
3.1	Basic design of industrial gear units of the MC..P.. series.....	17
3.2	Basic design of industrial gear units of the MC..R.. series.....	18
3.3	Unit designation / nameplates.....	19
3.4	Mounting positions.....	26
3.5	Mounting surface.....	26
3.6	Housing orientation M1..M6.....	27
3.7	Shaft positions.....	29
3.8	Direction of rotation.....	31
3.9	Lubrication of industrial gear units.....	35
4	Mechanical Installation	39
4.1	Required tools / resources.....	39
4.2	Before you begin.....	39
4.3	Preliminary work.....	39
4.4	Gear unit foundation.....	40
4.5	Mounting of solid shaft gear units.....	47
4.6	Mounting / removing hollow shaft gear units with keyed connection.....	49
4.7	Mounting / removing hollow shaft gear units with shrink disc.....	51
4.8	Mounting a motor with motor adapter.....	57
5	Mechanical Installation Options	60
5.1	Important installation instructions.....	60
5.2	Mounting of couplings.....	63
5.3	Backstop FXM.....	78
5.4	Shaft end pump SHP.....	81
5.5	Installation with steel frame.....	84
5.6	Torque arm.....	85
5.7	Mounting of V-belt drive.....	88
5.8	Oil heater.....	91
5.9	Temperature sensor PT100.....	97
5.10	SPM adapter.....	98
5.11	Fan.....	99
5.12	Flow switch.....	100
5.13	Visual flow indicator.....	103
5.14	Connecting the oil/water cooling system.....	104
5.15	Connecting the oil/air cooling system.....	104
5.16	Connecting the motor pump.....	104
6	Startup	105
6.1	Startup of MC gear units.....	105
6.2	Startup of MC gear units with backstop.....	106
6.3	Startup of MC gear units with steel oil expansion tank.....	106
6.4	Taking MC gear units out of operation.....	109
7	Inspection and Maintenance	110
7.1	Inspection and maintenance intervals.....	110
7.2	Lubricant change intervals.....	111
7.3	Inspection and maintenance of the gear unit.....	112
8	Malfunctions	118
8.1	Gear unit malfunctions.....	118

9	Mounting Positions	119
9.1	Symbols used.....	119
9.2	Mounting positions of MC..P.. gear units.....	120
9.3	Mounting positions of MC..R.. gear units.....	121
10	Design and Operating Notes	122
10.1	Guideline for oil selection.....	122
10.2	Lubricants for MC.. industrial gear units.....	126
10.3	Grease.....	128
10.4	Lubricant fill quantities.....	129
11	Change Index	130
11.1	Changes to the previous edition.....	130
12	Index	132



1 Important Information about the Operating Instructions

1.1 Important information and designated use

Integral part of the product

The operating instructions are part of the MC.. industrial gear units and contain important information for operation and service. The operating instructions are written for assembly, installation, startup and service employees who are involved in the installation and maintenance of MC.. industrial gear units.

Designated use

The designated use refers to the procedure specified in the operating instructions.

The MC.. industrial gear units are units run by motors for industrial and commercial systems. Gear unit utilizations other than those specified and areas of application other than industrial and commercial systems can only be used after consultation with SEW-EURODRIVE.

In compliance with the EG Machinery Directive 98/37/EG, the MC.. industrial gear units are components for installation in machinery and systems. In the scope of the EG directive, you must not take the machinery into operation in the designated fashion until you have established that the end product complies with the Machinery Directive 98/37/EG.

Qualified personnel

MC.. industrial gear units may represent a potential hazard for persons and material. Consequently, assembly, installation, startup and service work may only be performed by trained personnel who are aware of the potential hazards.

The personnel must be appropriately qualified for the task in hand and must be familiar with the assembly, installation, startup and operation of the product. The personnel must read the operating instructions, in particular the safety notes section, carefully and ensure that they understand and comply with them.

Liability for defects

Incorrect handling or any action performed that is not specified in these operating instructions could impair the properties of the product. In this case, you lose any right to claim under limited warranty against SEW-EURODRIVE GmbH & Co KG.

Product names and trademarks

The brands and product names contained within these operating instructions are trademarks or registered trademarks of the titleholders.

Waste disposal



(Please follow the latest instructions):

- Housing parts, gears, shafts and roller bearings of the gear units must be disposed of as steel scrap. This also applies to gray-cast iron parts if there is no special collection.
- Collect waste oil and dispose of it according to the regulations in force.



1.2 Explanation of symbols



Hazard

Indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.



Warning

Indicates an imminently hazardous situation caused by the product which, if not avoided, WILL result in death or serious injury. You will also find this signal to indicate the potential for damage to property.



Caution

Indicates a potentially hazardous situation which, if not avoided, MAY result in minor injury or damage to products.



Note

Indicates a reference to useful information, e.g. on startup.



Documentation reference

Indicates a reference to a document, such as operating instructions, catalog, data sheet.

1.3 Operating notes



- It is essential to contact SEW-EURODRIVE regarding a subsequent change of mounting position!
- The industrial gear units of the MC.. series are delivered without oil fill. Refer to the information on the nameplate!
- Refer to the instructions in the sections "Mechanical Installation" and "Startup"!

2 Safety Notes

2.1 Preface



The following safety notes are concerned with the use of MC.. industrial gear units.
If using gearmotors, please also refer to the safety notes for motors in the corresponding operating instructions.

Please also consider the supplementary safety notes in the individual sections of these operating instructions.

2.2 General information



Never install damaged products or take them into operation.

Submit a complaint to the shipping company immediately in the event of damage.

During or after operation, industrial gear units and motors have:

- Live parts
- Moving parts
- Hot surfaces (may be the case)

Only qualified personnel may carry out the following work:

- Installation / assembly
- Connection
- Startup
- Maintenance
- Servicing

The following information and documents must be observed during these processes:

- Relevant operating instructions and wiring diagrams
- Warning and safety signs on the gear unit
- System-specific regulations and requirements
- National / regional regulations governing safety and the prevention of accidents

Serious injuries and property damage may result from:

- Improper use
- Incorrect installation or operation
- Unauthorized removal of necessary protection covers or the housing



Transportation

Inspect the shipment for any damage in transit as soon as you receive the delivery. Inform the shipping company immediately. It may be necessary to preclude startup.

Startup / operation



Check that the direction of rotation is correct in decoupled status. Listen out for unusual grinding noises as the shaft rotates

Secure the key for test mode without output elements. Do not deactivate monitoring and protection equipment even for testing.

Switch off the main motor if in doubt whenever changes occur in relation to normal operation (e.g. increased temperature, noise, vibration). Determine the cause and contact SEW-EURODRIVE, if required.

Refer to the instructions in Sec. "Inspection and Maintenance."

Inspection / maintenance

2.3 Personal protective equipment

Always wear the following when carrying out work on the gear unit:

- Tight-fitting clothing (not prone to tear, no loose sleeves, no rings, etc.).
- Safety glasses for protecting the eyes from falling objects and liquids.
- Safety shoes for protection against heavy falling objects and slipping on a slippery floor.
- Hearing protection for protection against hearing damage for sound pressure levels exceeding 80 dB (A).



2.4 Transport of industrial gear units

Transport eyebolts

Tighten screwed in transport eyebolts [1] firmly. They are only designed for the weight of the industrial gear unit including the motor connected via motor adapter; do not attach any additional loads.

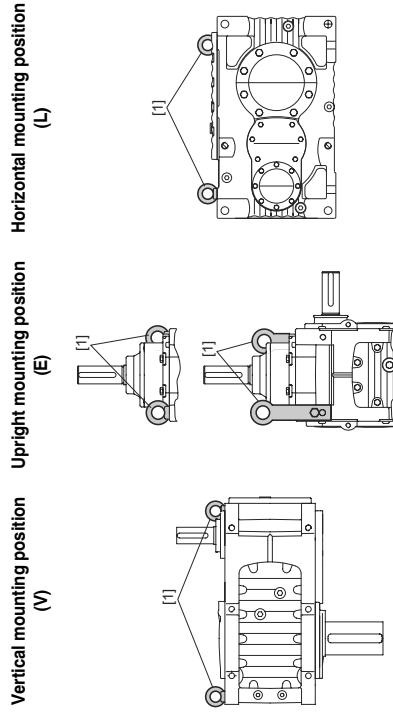


Figure 1: Positions of transport eyebolts

51375AXX



- The main gear unit must only be lifted using lifting ropes or chains on the two screwed in transport eyebolts on the main gear unit. The weight of the gear unit is indicated on the nameplate or the dimension sheet. The loads and regulations specified on the nameplate must always be observed.
- The length of the lifting chains or ropes must be dimensioned in such a way that the angle between the chains or ropes does not exceed 45°.
- Eyebolts on the motor, auxiliary gear unit or primary gear unit must not be used for transport (→ following figures)!

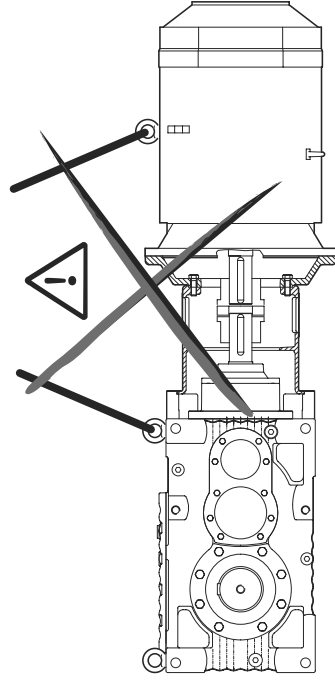
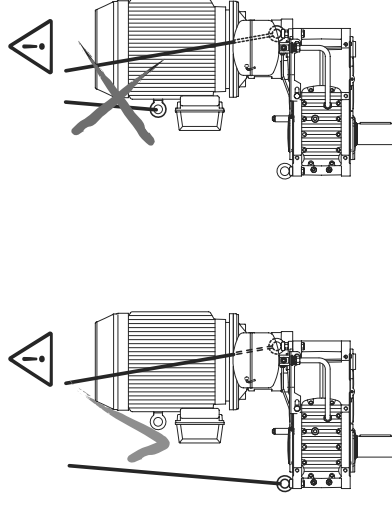


Figure 2: Do not use eyebolts on the motor for transport

52086AXX



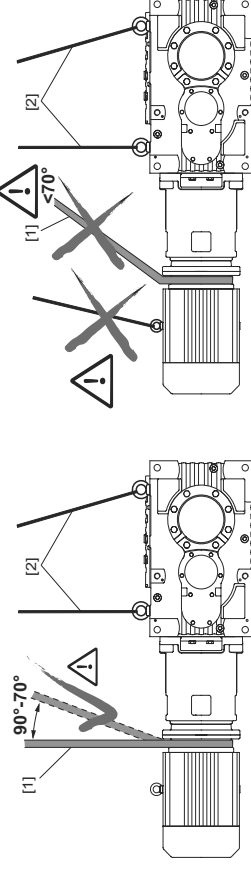
52112AXX

Figure 3: Do not use eyebolts on the motor for transport

- Use suitable, sufficiently rated handling equipment if necessary. Before startup, remove securing devices used for transport.

Transport of MC.. Industrial gear units with motor adapter

Industrial gear units of the MC.P.. / MC.R.. series with motor adapter (→ following figure) must only be transported using lifting ropes/chains [2] or lifting belts [1] at an angle of 90° (vertically) to 70°.



52110AXX

Figure 4: Transport of industrial gear unit with motor adapter – Do not use eyebolts on the motor for transport

Transport of MC.. industrial gear units on a base plate

Industrial gear units of the MC series on a base plate (→ following figure) must **only** be transported with the lifting ropes [1] or chains (angle 90°) **vertically** to the base plate:

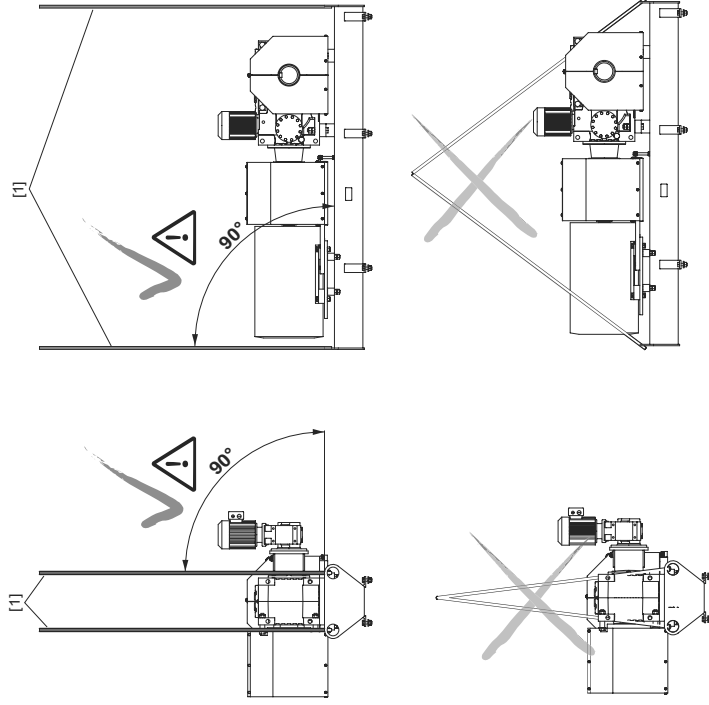


Figure 5: Transport of MC.. industrial gears unit on a base plate

51376AXX

Transport of MC.. industrial gear units on a swing base

Industrial gear units of the MC series on a swing base (→ following figures) must **only** be transported using lifting belts [1] and lifting ropes [2] at an **angle of 90° (vertically) to 70°**.

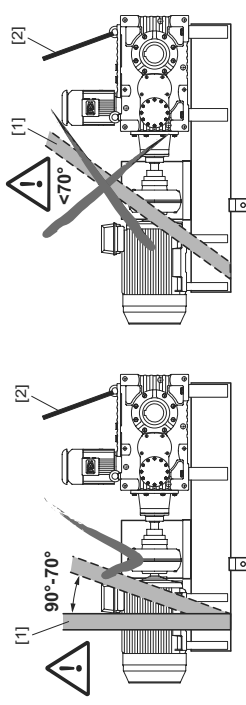


Figure 6: Transport of MC.. industrial gear unit on a swing base

52081AXX

Transport of MC.. industrial gear units with V-belt drive

Industrial gear units of the MC series with V-belt drive must **only** be transported using lifting belts [1] and lifting ropes [2] at an **angle of 90° (vertically)**. The eyebolts on the motor must **not** be used for transport.

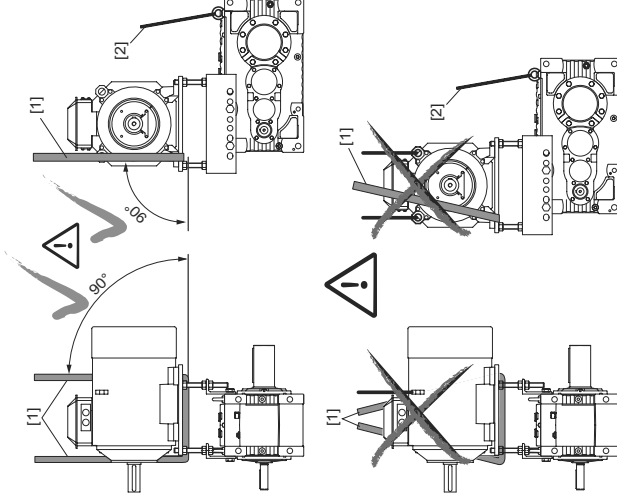


Figure 7: Transport of MC.. with V-belt drive

52111AXX

2.5 Corrosion and surface protection



The information in this chapter is valid for MC units assembled in Europe. For other regions, other painting systems might be applied. Please contact your local SEW-EURO-DRIVE assembly center for MC.. units.

Introduction

The corrosion and surface protection of gear units comprises the following three basic features:

1. Painting system
 - Standard painting system K7 E160/2
 - High-resistant painting system K7 E260/3 as option
2. Gear unit corrosion protection with
 - interior protection and
 - exterior protection
3. Gear unit packing
 - Standard packing (palette)
 - Wooden box
 - Seaworthy packing

Standard painting system K7 E 160/2

Painting is performed according to TEKNOS EPOXY SYSTEM K7, which is based on the high-solid epoxy paint TEKNOPLAST HS 150.

Two layer system K7 E 160/2	Thickness
• Epoxy primer	60 µm
• Teknoplant HS 150	100 µm
TOTAL	160 µm

Color shade: RAL 7031, blue gray

Powder coating, epoxy-based coat paint (EP) is used for guards and shields.

Layer thickness 65 µm

Color shade: TM 1310 PK, warning in yellow color

Guards and shields

High-resistant painting system K7 E 260/3

Painting is performed according to TEKNOS EPOXY SYSTEM K7, which is based on the high-solid epoxy paint TEKNOPLAST HS 150.

Three-layer system, E 260/3	thickness
• Epoxy primer	60 µm
• Teknoplant HS 150	2x100 µm
TOTAL	260 µm

Other color shades are possible on request.

Optional color shade

Usage of painting system

Environmental pollution	None	Low	Medium	High	Very high
Typical environmental conditions	Unheated buildings where condensation might occur	Atmospheres with low pollution, mostly rural areas	City and industrial atmospheres, moderate pollution with sulphur dioxide, coastal areas with low salt load	Industrial areas and coastal areas with moderate salt load	Buildings or areas with almost permanent condensation and high pollution
Mounting	Indoors	Indoors	Indoors or outdoors	Indoors or outdoors	Industrial areas with very high levels of moisture and aggressive atmospheres
Relative humidity	< 90 %	up to 95 %	up to 100 %	up to 100 %	Indoors or outdoors up to 100 %
Recommended painting system	Standard painting system K7 E160/2	Standard painting system K7 E160/2	Standard painting system K7 E160/2	High resistant painting system K7 E260/3	Contact SEW-EURODRIVE

Storage and transport conditions

Industrial gear units of the MC.. series are delivered without oil fill. Different protection systems are required depending on storage period and ambient conditions:

Storage period: up to ... months	Storage conditions			Transport conditions	
	OUTDOORS, roofed	INDOORS, heated (0...+20°C)	Storage area close to sea OUTDOORS, roofed	Land transport	Sea transport
6	Standard protection	Standard protection	Contact SEW-EURODRIVE	Standard packing	Seaworthy packing
12	Contact SEW-EURODRIVE	Standard protection	Contact SEW-EURODRIVE	Standard packing	Seaworthy packing
24	Long-term protection	Contact SEW-EURODRIVE	Contact SEW-EURODRIVE	Standard packing	Seaworthy packing
36	Contact SEW-EURODRIVE	Long-term protection	Contact SEW-EURODRIVE	Standard packing	Seaworthy packing

Standard protection / interior

- Gear units undergo a test run with oil. The oil is drained by SEW-EURODRIVE before dispatch. The remaining layer of oil on the inner parts serves as basic protection.

Standard protection / exterior

- Oil seals and seal surfaces are protected by suitable grease.
- Unpainted surfaces (including spare parts) are covered with a protective coating. Before other equipment is mounted to such surfaces, the protective coating must be removed using a solvent.
- Small spare parts and loose pieces, such as screws, nuts, etc., are supplied in corrosion protected plastic bags (VCI corrosion protection bag).
- Threaded holes and blind holes are covered by plastic plugs.
- The breather plug (position → chapter "Mounting Positions") is already installed.

Standard protection / packing

Standard packing is used: The gear unit is delivered on a palette without cover



Figure 8: Standard protection / packing
55871AXX



- If the gear unit is stored longer than 6 months, it is recommended to regularly check the protective coating of unpainted areas as well as the paint coat. Areas with removed protection coating or paint have to be repainted, if necessary.
- The LSS must be rotated at least one turn in such a way that the position of the roller elements in the bearings of LSS and HSS changes. This procedure has to be repeated every 6 months until startup.

Long-term protection / interior

The following procedure is applied in addition to the "standard protection":

- A VPI solvent is sprayed through the oil filling hole
- The breather plug is replaced with a screw plug (before startup, the screw plug must be replaced again by the breather plug, which is attached to the gear unit separately)
- Never open the gear unit near open flames, sparks and hot objects because solvent vapors might be ignited.
- Take preventive measures to protect people from solvent vapors. It is absolutely crucial that open flames are avoided when the solvent is applied and when the solvent evaporates.



Alternative packing

Optionally, the gear unit can be supplied in a wooden box with standard gear unit protection.

Long-term protection / exterior

- Oil seals and seal surfaces are protected through suitable grease
- Unpainted surfaces (including spare parts) are covered with a protective coating. Before other equipment is mounted to such surfaces, the protective coating must be removed using a solvent.
- Small spare parts and loose pieces, such as screws, nuts, etc., are supplied in corrosion protected plastic bags (VCI corrosion protection bag).
- Threaded holes and blind holes are covered by plastic plugs
- The breather plug (Position → chapter "Mounting Positions") is already installed.

Long-term protection / packing

- Seaworthy packing is used: The gear unit is packed in a seaworthy plywood box with a wooden frame



Figure 9: Long-term protection / packing
57585AXX



- If the gear unit is stored for longer than 6 months, it is recommended to regularly check the protective coating of unpainted areas as well as the paint coat. Areas with removed protection coating or paint have to be repainted, if necessary.
- The LSS must be rotated at least one turn in such a way that the position of the roller elements in the bearings of LSS and HSS changes. This procedure must be repeated every 6 months until startup.
- The interior long-term protection with the VPI solvent has to be repeated every 24 / 36 months (according to the table "Storage and transport conditions") until startup.

3 Gear Unit Design



The following illustrations serve to explain the general design. Their only purpose is to facilitate the assignment of components to the spare parts lists. Discrepancies are possible depending on gear unit size and version!

3.1 Basic design of industrial gear units of the MC..P.. series

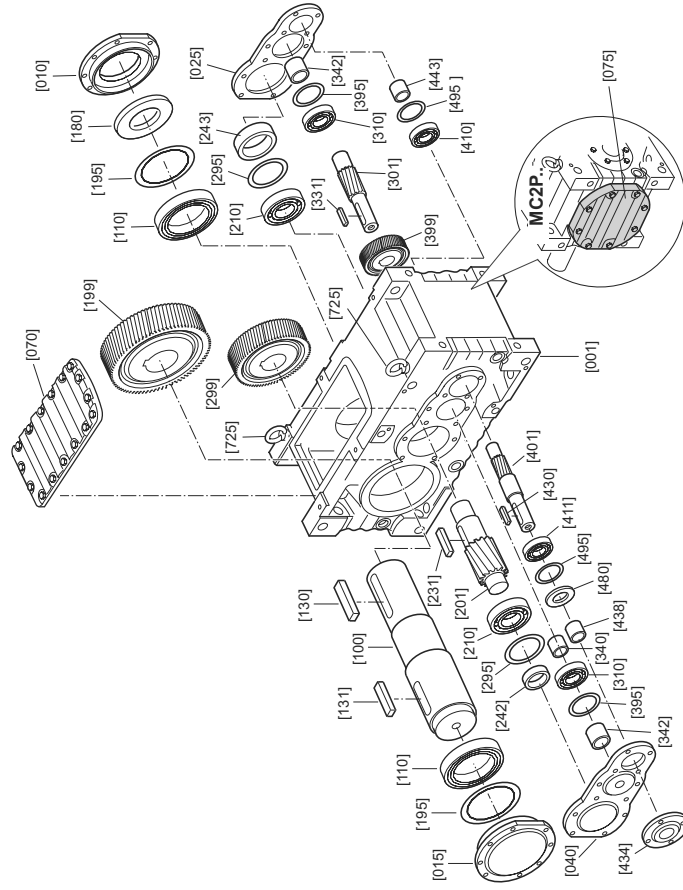


Figure 10: Basic design of industrial gear units of the MC.P.. series

[001] Gear unit housing	[131] Key	[299] Gear wheel	[410] Bearing
[010] Bearing cover	[180] Oil seal	[301] Pinion shaft	[411] Bearing
[015] Bearing cover	[195] Shim	[310] Bearing	[430] Key
[025] Bearing cover	[199] Output gear wheel	[331] Key	[434] Cover
[040] Bearing cover	[201] Pinion shaft	[340] Distance bushing	[438] Bushing
[070] Housing cover	[210] Bearing	[342] Distance bushing	[443] Distance bushing
[075] Assembly cover	[231] Key	[395] Shim	[480] Oil seal
[100] Output shaft	[242] Distance piece	[399] Gear wheel	[495] Shim
[110] Bearing	[243] Distance piece	[401] Input shaft	[725] Lifting eyebolt
	[295] Shim		
	[130] Key		

3.2 Basic design of industrial gear units of the MC..R.. series



Gear Unit Design

Basic design of industrial gear units of the MC..R.. series

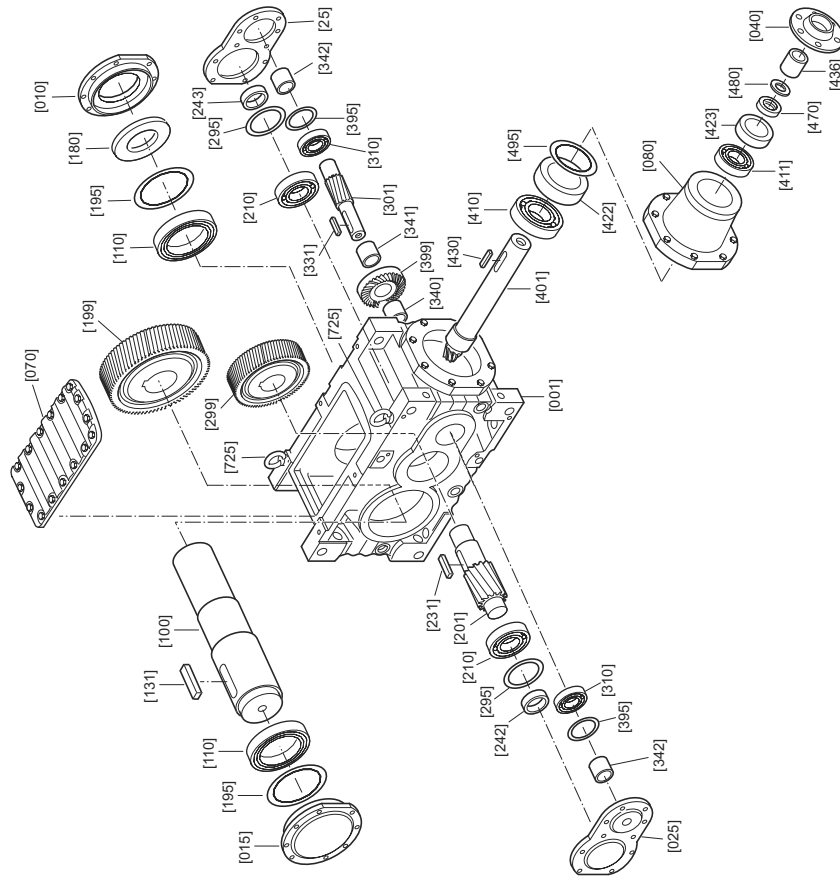


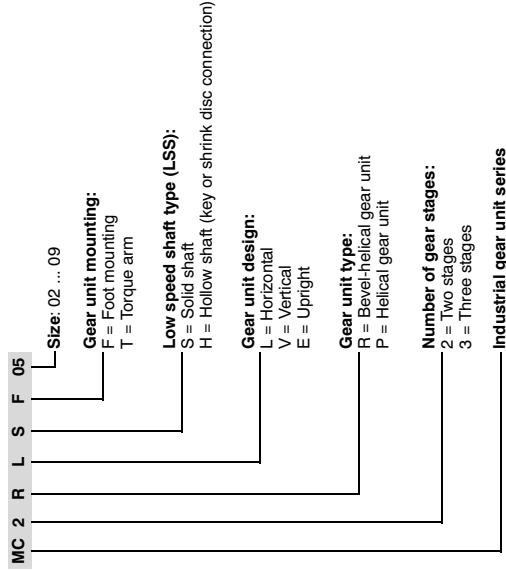
Figure 11: Basic design of industrial gear units of the MC..R.. series

[001] Gear unit housing	[131] Key	[299] Gear wheel	[410] Bearing
[010] Bearing cover	[180] Oil seal	[301] Pinion	[411] Bearing
[015] Bearing cover	[195] Shim	[310] Bearing	[422] Bearing bushing
[025] Bearing cover	[199] Output gear wheel	[331] Key	[423] Bearing bushing
[040] Cover	[201] Pinion shaft	[340] Distance bushing	[430] Key
[070] Housing cover	[210] Bearing	[341] Distance bushing	[436] Sleeve
[080] Bearing cover	[231] Key	[342] Distance bushing	[470] Tightening nut
[100] Output shaft	[242] Distance bushing	[395] Shim	[480] Oil seal
[110] Bearing	[243] Distance bushing	[399] Bevel gear	[495] Shim
[130] Key	[295] Shim	[401] Bevel pinion shaft	[725] Lifting eyebolt



3.3 Unit designation / nameplates

Sample unit designation



Example: Nameplate of the MC.. series industrial gear unit, SEW-EURODRIVE

SEW-EURODRIVE Bruchsal / Germany

Type MC3RLSF02

Nr. 1 03 307647

Nr. 2 K3463

norm. min. max. i 1: 203123

PK1 [kW] 16.5 16.5 FS 364

Mk2 [kNm] 2.04 2.04 FR1 [kN] 0

n1 [1/min] 1500 1500 FR2 [kN] 0

n2 [1/min] 73.8 73.8 FA1 [kN] 0

Operation instructions have to be observed! FA2 [kN] 0

Made by SEW-Finland

Mass [kg] 219

Qty of greasing points 2 Fans 0

Lubricant Mineral Oil ISO VG 460 EPRAO-7 ltr. Year 2003

57523AXX

Typ		Unit designation
Nr. 1		Serial number 1: Eurodrive order number (e.g. SAP-order number)
Nr. 2		Serial Number 2: (factory / assembly center manufacturing number)
P _{K1}	norm.	Running power on gear unit input @ n ₁ norm.
	min.	Running power on gear unit output @ n ₁ min.
	max	Running power on gear unit output @ n ₁ max.
M _{K2}	norm.	Running torque on gear unit output @ n ₁ norm.
	min.	Running torque on gear unit output @ n ₁ min.
	max	Running torque on gear unit output @ n ₁ max.
n ₁	norm.	Input speed (HSS)
	min.	Minimum existing input speed (HSS)
	max	Maximum existing input speed (HSS)
n ₂	norm.	Output speed (LSS)
	min.	Minimum existing output speed (LSS)
	max	Maximum existing output speed (LSS)
Made by		Location of gear unit assembly / manufacturing
norm.		normal operation point
min.		minimum operation point
max.		maximum operation point
i		Exact gear unit reduction ratio
F _S		Service factor
F _{R1}	[kN]	Existing radial load on HSS
F _{R2}	[kN]	Existing radial load on LSS
F _{A1}	[kN]	Existing axial load on HSS
F _{A2}	[kN]	Existing axial load on LSS
Mass	[kg]	Gear unit weight



Qty of greasing points:	Number of points that require regreasing (e.g. in case of regreasable labyrinth seals or drywell sealing system)
Fans	Number of cooling fans mounted on gear unit
Lubricant	Oil grade and viscosity class / oil volume
Year	Year of assembly
IM	Mounting Position: Housing orientation and mounting surface
TU	Temperature permitted range of ambient

Example: Nameplate of the MC.. series industrial gear unit, SEW-EURODRIVE

SEW-EURODRIVE

Bruchsal/Germany

Typ

MC3RLHF07

Nr. 1

01.3115835301.0001.02

Nr. 2

T34567

Pe kW

55

MM2

kNm

35.6

Fs

1.6

kg

780

i 1:

61.883 : 1

Year

2004

n r/min

1480/23.9

Lubricant

CLP 220 Miner..Oil/ca. 33 liter4

Number of greasing points:

4

Made by SEW

57524AXX

Type	Unit designation
Nr. 1	Serial number 1
Nr. 2	Serial number 2
P _e	[kW] Absorbed power on the input shaft
F _s	Service factor
n	[r/min] Input/output speed
kg	Weight
i	Exact gear unit reduction ratio
Lubricant	Oil grade and viscosity class / oil volume
M _{N2}	[kNm] Rated torque of the gear unit
Year	Year of manufacture
Number of greasing points	Number of points that require regreasing



Example: Nameplate of the MC series industrial gear unit, SEW-EURODRIVE China

SEW

EURODRIVE

Type

MC3PLHF04

SO

351012345 . 01 . 35001

IM

T3

Pe

PK1 = 55

kW

Ma

6 . 65

kNm

ne

1500

r/min

na

65

r/min

i

23 . 2042

kg

ISO

VG460

Refer to lubrication schedule

51965AXX

Type	Unit designation
IM	Shaft position
P _e	[kW] Absorbed power on the input shaft
M _a	[Nm] Output torque on the output shaft
n _e	[r/min] Input speed
n _a	[r/min] Output speed
i	Exact gear unit reduction ratio
S.O.	Order number

Example: Nameplate of the MC series industrial gear unit, SEW-EURODRIVE Singapore

SEW

EURODRIVE

Type

MC3PLHF04

SO

351012345 . 01 . 35001

IM

T3

Pe

PK1 = 55

kW

Ma

6 . 65

kNm

ne

1500

r/min

na

65

r/min

i

23 . 2042

kg

ISO

VG460

Refer to lubrication schedule

Assembled in Singapore

51351AXX

Type	Unit designation
IM	Shaft position
P _e	[kW] Absorbed power on the input shaft
M _a	[Nm] Output torque on the output shaft
n _e	[r/min] Input speed
n _a	[r/min] Output speed
i	Exact gear unit reduction ratio
S.O.	Order number



Gear Unit Design
Unit designation / nameplates

Example: Nameplate of the MC series industrial gear unit, SEW-EURODRIVE Brazil

SEW DO BRASIL LTDA		Rod. Pres. Dutra km 378 CEP:0710-000 GUARULHOS-SP C.S.C.: 40.643.001/0001-49		
Tipo: MC3PLS07				
Nº	7007117383446/301.001	IM	13	
Ptê	148	Mas	19.100	Nm
Ø	1780	na	70.6	rpm
i	25.2024	kg		
b	145			
OIEO ISO VG 480 EP _ 45 LITROS				
BR1				
Lubrificação conforme Manual Indústria Brasileira				
Use Mobil				

1831551.10

Type	Unit designation
No	Order number
P_e	Absorbed power on the input shaft [kW]
M_a	Output torque on the output shaft [Nm]
n_e	Input speed [rpm]
n_a	Output speed [rpm]
i	Exact gear unit reduction ratio
IM	Shaft position
f_s	Service factor

51598AXX



Gear Unit Design
Unit designation / nameplates

Example: Nameplate of the MC series industrial gear unit, SEW-EURODRIVE USA

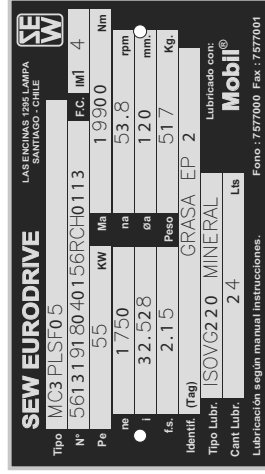
SEW-EURODRIVE, INC. USA		Compact Reducer	
Type	MC3PESF03		
S.O.	870111234	02.02.001	
<input type="radio"/> In	1750	rpm	15.1
<input type="radio"/> HP	15	Torque	60.442
		Service	Factor
Ratio	116.9634		1.50
Shift Position	24	Min.Amb	0 °C
Lubrication		Max.Amb	40 °C
SYN. ISOV6460		7EP: 8	GALS

See Operating Instructions

Type		Unit designation
In	[rpm]	Input speed
Out	[rpm]	Output speed
HP	[HP]	Absorbed power on the output shaft
Torque	[lb-in]	Output torque
Ratio		Exact gear unit reduction ratio
Service Factor		Service factor
Shaft Position		Shaft position
Min Amb	[°C]	Minimum ambient temperature
Max Amb	[°C]	Maximum ambient temperature
Lubrication		Oil grade and volume
S.O.		Shop order number

51349AXX

Example: Nameplate of the MC series industrial gear unit, SEW-EURODRIVE Chile



56624AXX

Tipo		Unit designation
N°		Serial number 1
F.C.		Shaft position
P _e	[kW]	Input power
η _e		Input speed
i		Exact gear unit reduction ratio
f.s.		Service factor
Identif.		Grease type
Tipo Lubr.		Oil grade and viscosity class
Cant Lubt.		Oil quantity
Ma	[Nm]	Gear unit nominal torque
na	[rpm]	Output speed
Ø a	[mm]	LSS shaft diameter
Peso	[Kg]	Weight of gear unit

3.5 Mounting surface

Definition

The mounting surface is defined as the surface(s) of the foot or flange mounted gear unit to which the customer's machine is mounted.

Designations

Six different mountings surfaces have been defined (designations "F1" to "F6"):

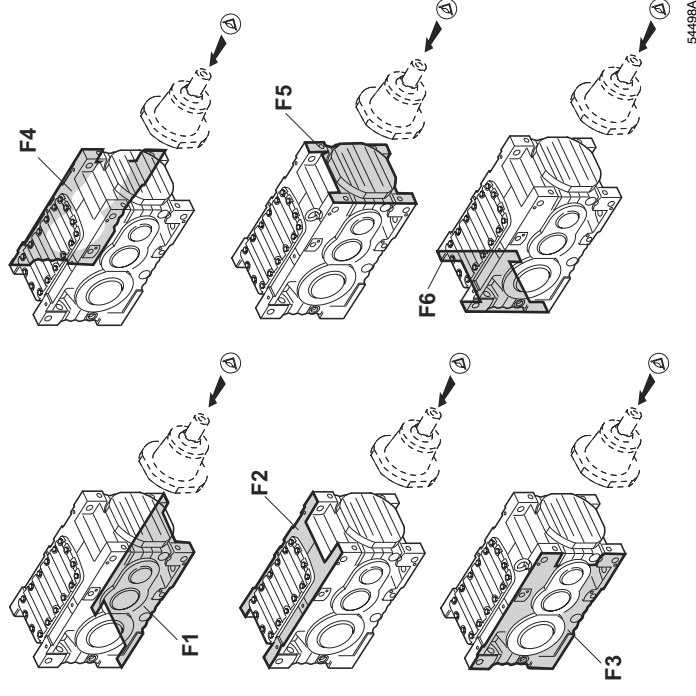


Figure 12: Mounting surface

3.6 Housing orientation M1...M6

The housing orientation is defined as the position of the housing in space and is defined using the designations M1...M6.

Each housing orientation corresponds to a certain

- gear unit design (L, V, E)
- standard mounting surface (F1...F6)

The housing orientation is defined separately for

- MC..P.. helical units
- MC..R.. bevel-helical units

Unless specified otherwise, the **standard correlation** of

- gear unit design and
 - housing orientation and
 - mounting surface
- is as follows (foot mounted gear units):



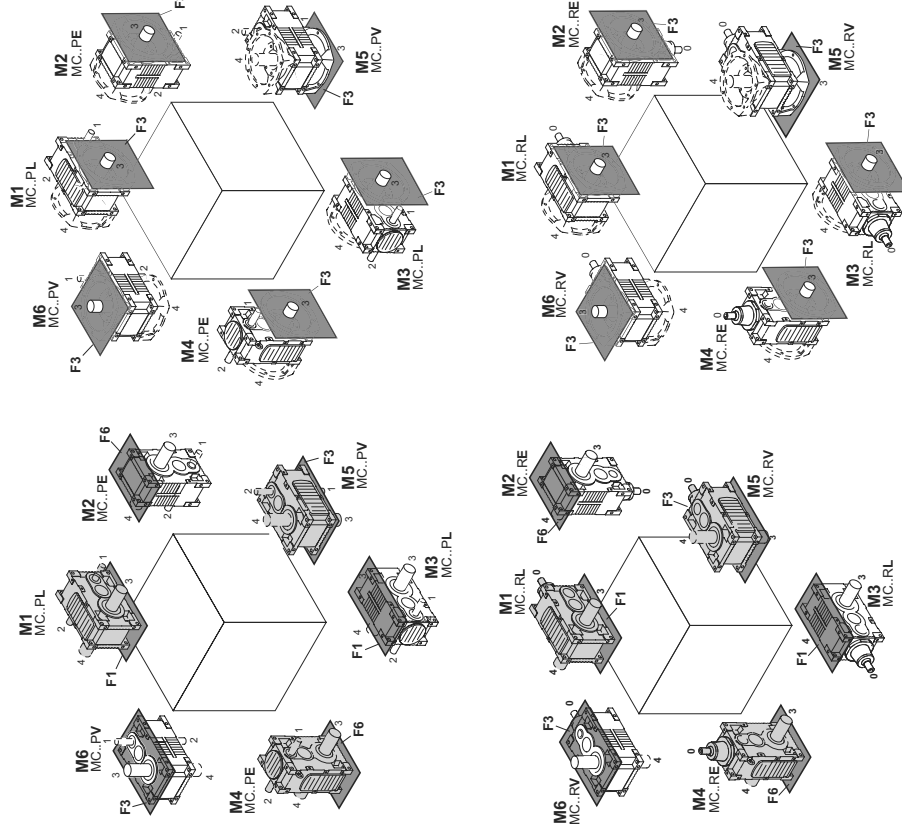
Standard correlation of gear unit design and housing orientation

MC..PL:	M1, F1
MC..PV:	M5, F3
MC..PE:	M4, F6
MC..RL:	M1, F1
MC..RV:	M5, F3
MC..RE:	M4, F6

For gear units with mounting flange on the LSS, the standard position of the flange depends on the shaft position of the LSS unless specified otherwise:

- Shaft position 3 → LSS mounting flange F3
- Shaft position 4 → LSS mounting flange F4

Housing orientation and standard mounting surface



- The units marked in gray are standard design.
- Other mounting surfaces are possible in conjunction with a certain housing orientation. Please refer to order-specific dimension drawing.

It is not allowed to change the housing orientation and/or mounting surface deviating from the order.

3.7 Shaft positions

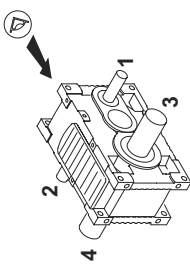
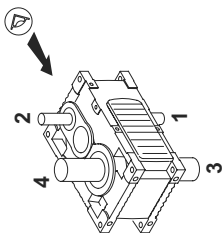
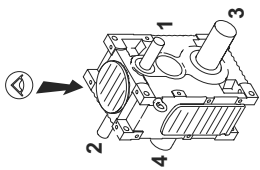


The shaft positions (0, 1, 2, 3, 4) and directions of rotation shown in the following figures apply to output shafts (LSS) of the types **solid shaft and hollow shaft**. For other shaft positions or gear units with backstop, contact SEW-EURODRIVE.

The following shaft positions (0, 1, 2, 3, 4) are possible:

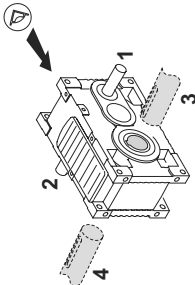
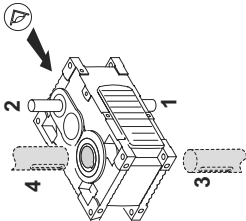
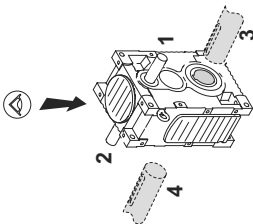
Shaft positions MC.P.S..

Housing orientation		M4
M5	Gear unit design Vertical LSS (V)	Upright mounted (E)
M1	Horizontal LSS (L)	

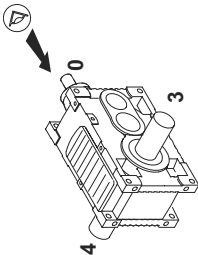
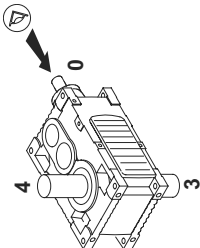
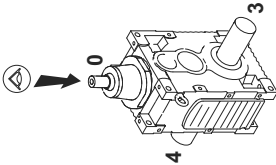
		
---	---	---

Shaft positions MC.P.H..

Housing orientation		M4
M5	Gear unit design Vertical LSS (V)	Upright mounted (E)
M1	Horizontal LSS (L)	

		
---	---	---

Shaft positions MC.R.S..

M1	Housing orientation M5	M4
Horizontal LSS (L)	Gear unit design Vertical LSS (V)	Upright mounted (E)
		

Shaft positions MC.R.H..

Housing orientation		M4
M5	Gear unit design Vertical LSS (V)	Upright mounted (E)
M1	Horizontal LSS (L)	

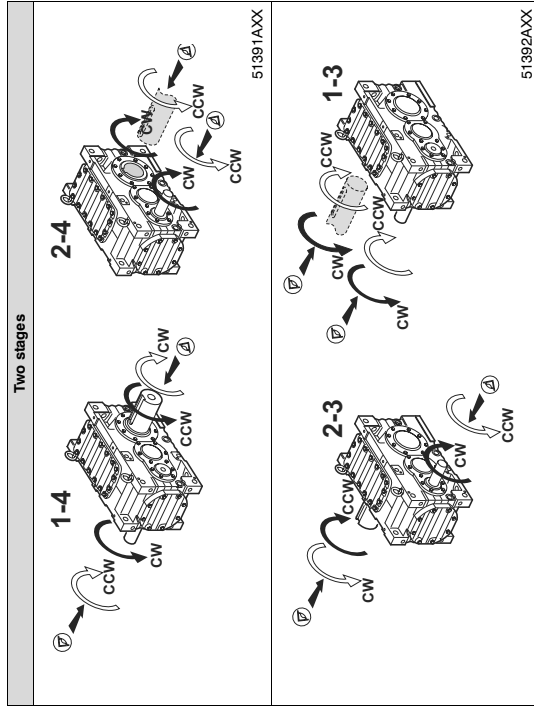


3.8 Direction of rotation

The directions of rotation of the outputs shaft (LSS) are defined as follows:

Direction of rotation	Gear unit version	
	MC.P.S., MC.R.S.,	MC.P.H., MC.R.H.,
Clockwise (CW)		
Counter-clockwise (CCW)		

The following figures show shaft positions and corresponding directions of rotation for industrial gear units of the MC2P... series.

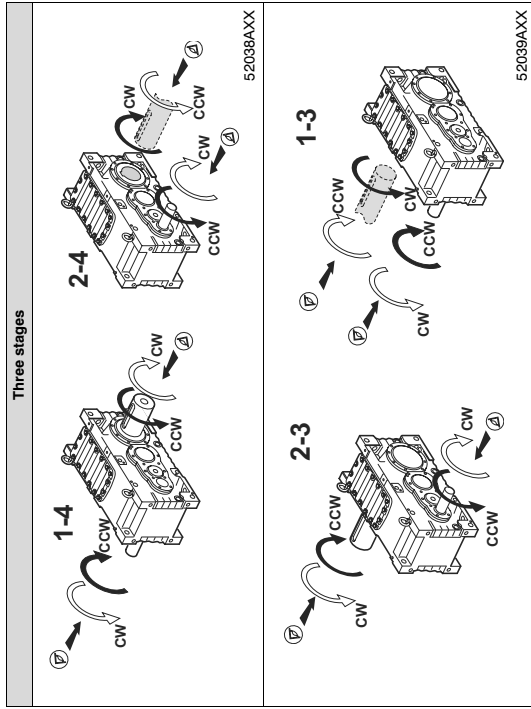


Shaft positions and corresponding directions of rotation of MC2P.

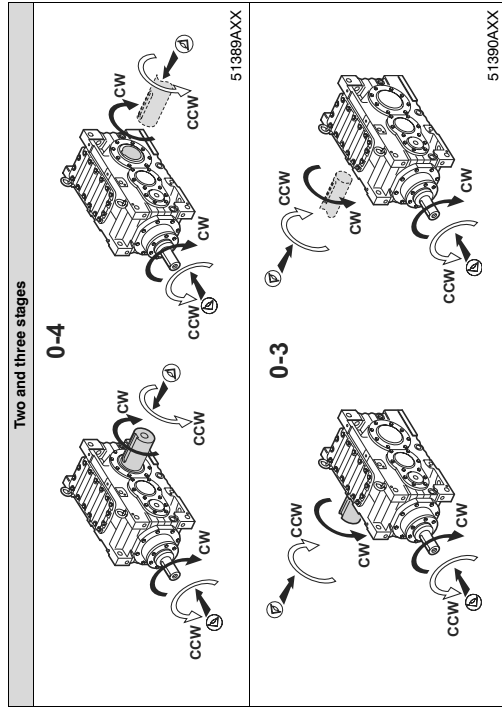


Shaft positions and corresponding directions of rotation of MC3P.

The following figures show shaft positions and corresponding directions of rotation for industrial gear units of the MC3P... series.

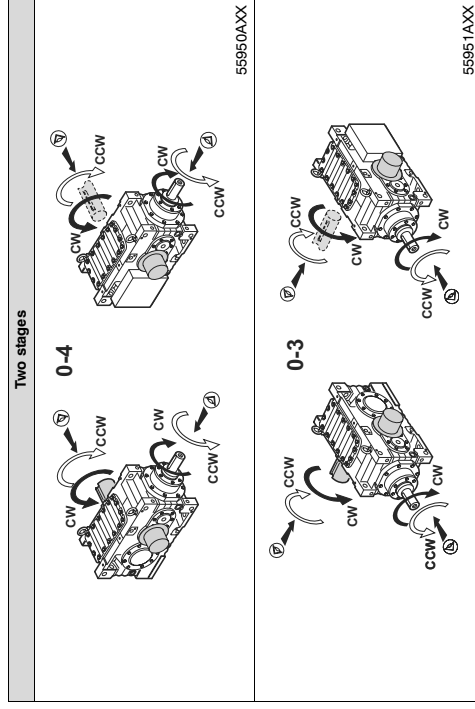


The following figures show shaft positions and corresponding directions of rotation for industrial gear units of the MC.R... two and three stage series without backstop.



Shaft positions and corresponding directions of rotation of MC.R. without backstop

The following figures show shaft positions and corresponding directions of rotation for two-stage gear units with backstop of the types MC.RS.. and MC.RH.. with keyway.



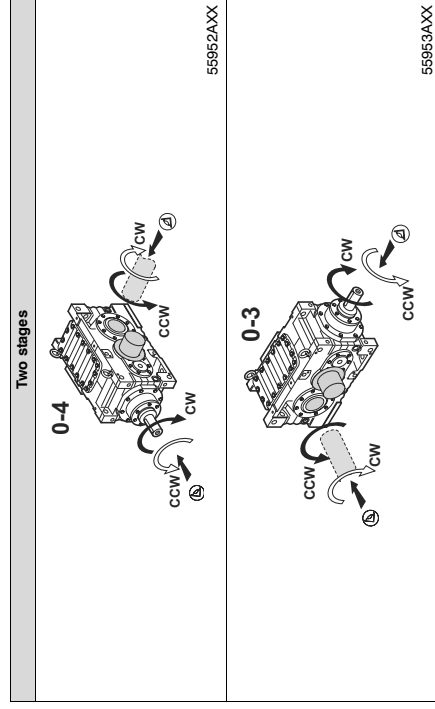
Shaft positions and corresponding directions of rotation of MC2RS../MC2RH.. keyway with backstop



Only one direction of rotation is possible, which has to be defined in the order. The permitted direction of rotation is indicated on the housing.

Shaft positions and corresponding directions of rotation of MC2RH../SD shrink disc units with backstop

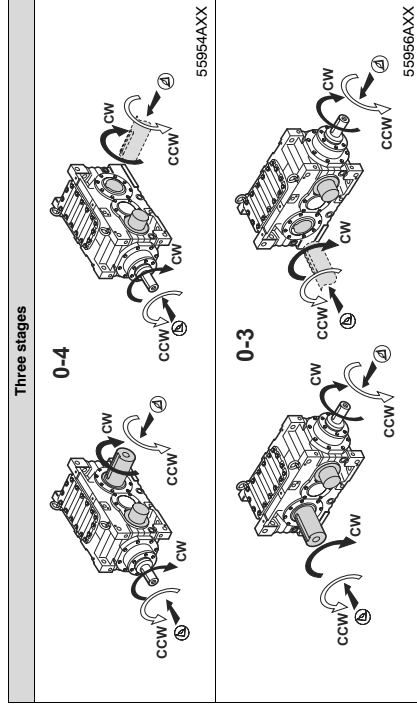
Below figures show shaft positions and corresponding directions of rotation for two-stage gear units with backstop of the type MC.RS.. with shrink disc.



Only one direction of rotation is possible, which has to be specified in the order. The permitted direction of rotation is indicated on the housing.

Shaft positions and corresponding directions of rotation of MC3R.. industrial gear units backstop on driven machine end

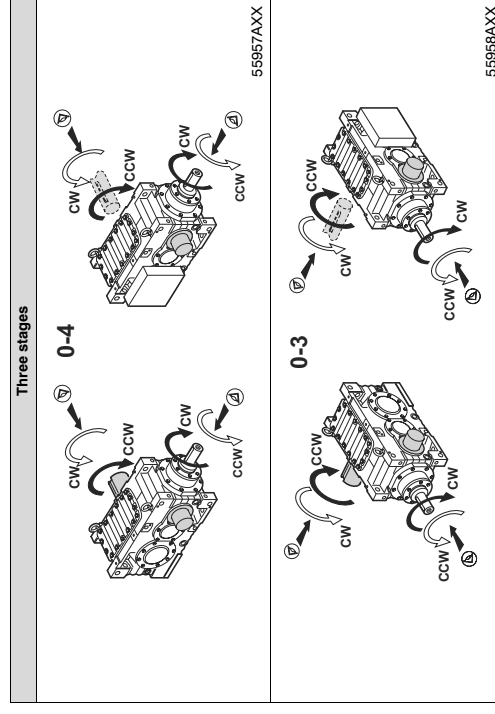
The following figures show shaft positions and corresponding directions of rotation for MC.RS.. and MC.RH.. units with keyway and backstop.



Only one direction of rotation is possible, which has to be specified in the order. The permitted direction of rotation is indicated on the housing.

Shaft positions and corresponding directions of rotation of MC3R.. Backstop opposite to driven machine end

The following figures show shaft positions and corresponding directions of rotation for MC.RS.. and MC.RH.. units with keyway and backstop.



Only one direction of rotation is possible, which has to be specified in the order. The permitted direction of rotation is indicated on the housing.



3.9 Lubrication of industrial gear units

Depending on the **mounting position**, the **lubrication types "splash lubrication" or "bath lubrication"** are used for industrial gear units of the MC... series.

Splash lubrication

Splash lubrication is used for industrial gear units of the MC... series in horizontal mounting position (unit designation MC.L.). With splash lubrication, the oil level is low. With this lubrication method, oil is splashed onto the bearings and gearing components.

Oil bath lubrication

Oil bath lubrication is used for industrial gear units of the MC... series in horizontal mounting position (unit designation MC.V.) and upright mounting position (unit designation MC.E.) With oil bath lubrication, the oil level is so high that the bearings and gearing components are completely submerged in the lubricant.

Oil expansion tanks are always used for industrial gear units of the MC.PV..., MC.RV... and MC.RE... series with **oil bath lubrication**. **Oil expansion tanks allow the lubricant to expand when the gear unit heats up during operation.**

Disregarding the mounting position, a steel oil expansion tank is used when the unit is installed outdoors and when the ambient conditions are very humid. This tank can be used both for the version with solid shaft and hollow shaft. A membrane in the oil expansion tank separates the oil in the gear unit from the humid ambient air and thus ensures that no humidity can build up in the gear unit.

Symbols used

The following table shows which symbols are used in the subsequent figures and what they mean.

Symbol	Meaning
	Breather plug
	Inspection opening
	Oil dipstick
	Oil drain plug
	Oil filling plug
	Oil sight glass
	Air outlet screw



Oil bath lubrication upright mounting position

The steel oil expansion tank [6] is used for industrial gear units of the **MC series in upright mounting position** (unit designation **MC.PE...** or **MC..RE...**).

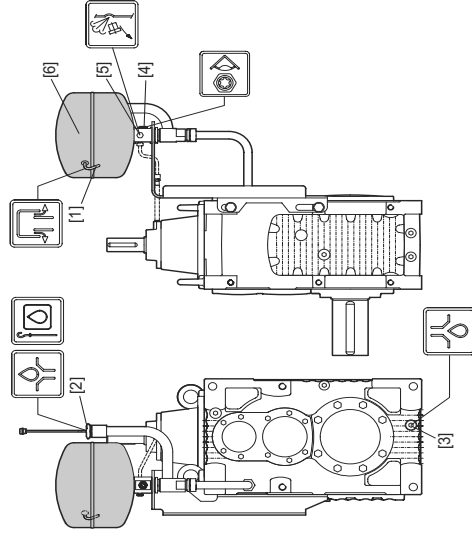


Figure 13: MC.PE../MC.RE... industrial gear units with steel oil expansion tank

- [1] Breather
- [2] Oil dipstick
- [3] Oil drain plug
- [4] Oil sight glass
- [5] Air outlet screw
- [6] Steel oil expansion tank

51586AXX

Oil bath lubrication vertical mounting position

The steel oil expansion tank [6] for industrial gear units of the **MC series in vertical mounting position** (unit designation **MC.PV.. / MC.RV..**) is located on the side of the assembly cover.

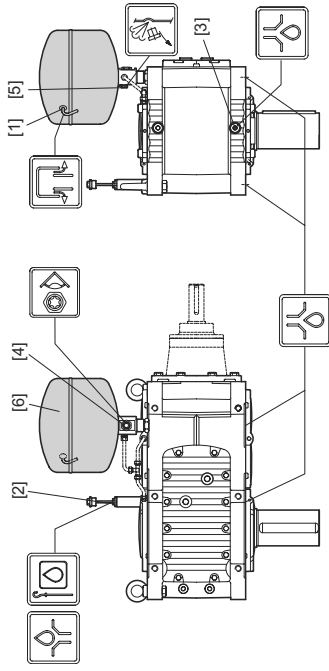


Figure 14: MC.PV../MC.RV.. industrial gear unit with steel oil expansion tank

- [1] Breather
- [2] Oil dipstick
- [3] Oil drain plug
- [4] Oil sight glass
- [5] Air outlet screw
- [6] Steel oil expansion tank

In **dry environmental conditions**, a **cast iron oil expansion tank** [1] is used. This oil expansion tank is only used for the vertical mounting position with the **solid output shaft pointing downwards** (unit designation MC.PVSF.. or MC.RVSF..).

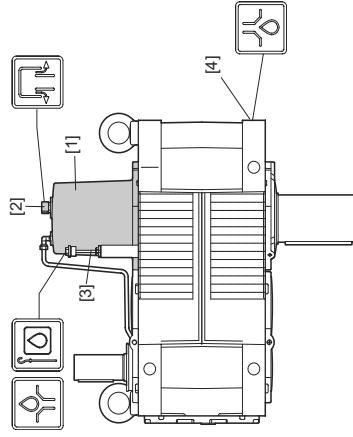


Figure 15: MC.PVSF../MC.RVSF.. industrial gear unit with cast iron oil expansion tank

- [1] Cast iron oil expansion tank
- [2] Breather plug
- [3] Oil dipstick
- [4] Oil drain plug

Pressure lubrication

If requested, pressure lubrication is possible as lubrication method **disregarding the mounting position**.

With pressure lubrication, the oil level is low. For sizes 04 to 09, the gearing components and bearings not submerged in the oil bath are lubricated through a shaft end pump (→ Sec. "Shaft end pump"), or, with sizes 02 to 09, through a motor pump ("Sec. → Motor pump").

The lubrication method "pressure lubrication" is used when

- oil bath lubrication is not desired for upright or vertical mounting positions
- input speeds are very high
- the gear unit must be cooled by an external oil/water (→ Sec. "Oil/water cooling system") or oil/air cooling system (→ Sec. "Oil/air cooling system")



For more details on oil expansion tanks, refer to Sec. "Mounting Positions".



4 Mechanical Installation

4.1 Required tools / resources

Not included in the scope of delivery:

- Wrench set
- Torque wrench (for shrink discs)
- Motor attachment to motor adapter
- Mounting device
- Shims and spacing rings if necessary
- Fasteners for input and output elements
- Lubricant (e.g. NOCO® fluid from SEW-EURODRIVE)
- For hollow shaft gear units (→ Sec. "Mounting/removal of hollow shaft gear units with keyed connection"): Threaded rod, nut (DIN 934), retaining screw, ejector screw
- Securing components according to Sec. "Gear unit foundation"

Installation tolerances

Shaft end	Flanges
Diametric tolerance in accordance with DIN 748 <ul style="list-style-type: none">• ISO k6 for solid shafts with $\varnothing \leq 50$ mm• ISO m6 for solid shafts with $\varnothing > 50$ mm• ISO H7 for hollow shafts for shrink disc• ISO H8 for hollow shafts with keyway• Center hole in accordance with DIN 332, shape DS..	Centering shoulder tolerance: <ul style="list-style-type: none">• ISO js7 / H8

4.2 Before you begin

The drive may only be installed if

- the data on the nameplate of the motor match the supply voltage
- the drive is not damaged (no damage resulting from transport or storage) and
- the following requirements have been properly met:
 - with **standard gear units**:
ambient temperature according to the lubricant table in Sec. "Lubricants" (see standard), no oil, acid, gas, vapors, radiation, etc.
 - with **special versions**:
drive configured in accordance with the ambient conditions (→ order documents)

4.3 Preliminary work

Output shafts and flange surfaces must be completely free of anti-corrosion agents, contamination or other impurities (use a commercially available solvent). Do not let the solvent get in contact with the sealing lips of the oil seals: danger of damage to the material!



4.4 Gear unit foundation

Foundation for foot-mounted gear units

To ensure quick and successful mounting, the type of foundation should be correctly selected and the mounting carefully planned in advance. Foundation drawings with all necessary construction and dimension details should be available.

SEW-EURODRIVE recommends foundation methods shown in the following figures. A customer's own foundation method must be equally adequate.

When mounting a gear unit onto steel framework, special attention should be paid to the rigidity of this framework to prevent destructive vibrations and oscillations. The foundation must be dimensioned according to weight and torque of the gear unit by taking into account the forces acting on the gear unit.

Example 1

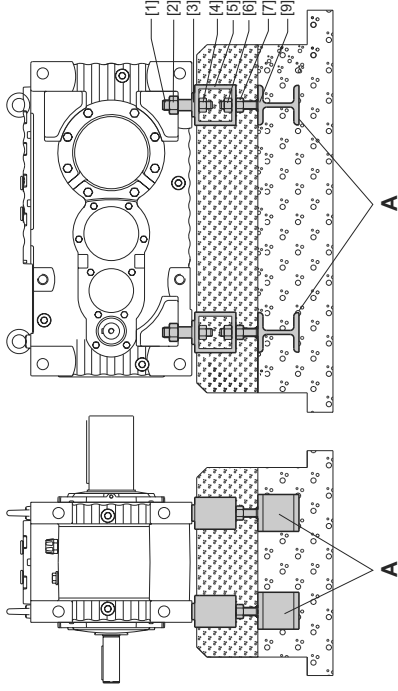


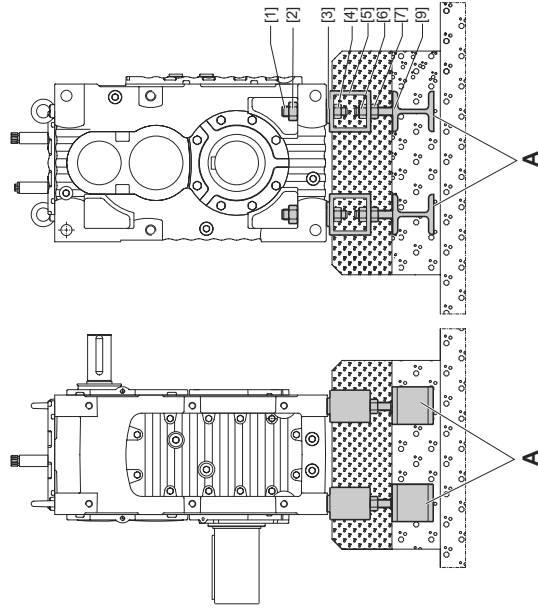
Figure 16: Reinforced concrete foundation for MC.PL., / MC.RL., industrial gear units
Pos. "A" → Sec. "Concrete base"

- [1] Hex head screw or stud
- [2] Hex nut if [1] is a stud or an upside-down screw
- [3] Shims (about 3 mm space for shims)
- [4] Hex nut
- [5] Foundation bracket
- [6] Hex nut
- [7] Hex nut and foundation screw
- [8] Supporting girder
- [9] Supporting girder

51403XXX



Example 2



51406AXX

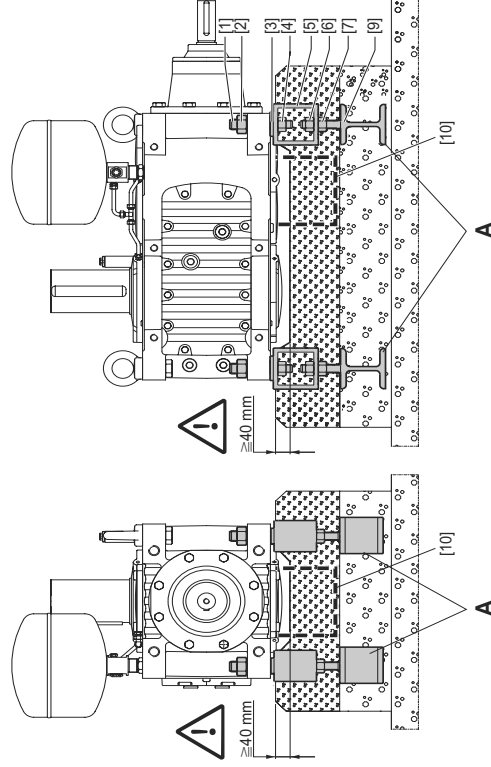
Figure 17: Reinforced concrete foundation for MC.PE. / MC.RE. industrial gear units

Pos. "A" → Sec. "Concrete base"

- (1) Hex head screw or stud
- (2) Hex nut if (1) is a stud or an upside-down screw
- (3) Shims (about 3 mm space for shims)
- (4) Hex nut
- (5) Foundation bracket
- (6) Hex nut
- (7) Hex nut and foundation screw
- (9) Supporting girder



Example 3



51413AXX

Figure 18: Reinforced concrete foundation for MC.PV. / MC.RV. industrial gear units

Pos. "A" → Sec. "Concrete base"

- (1) Hex head screw or stud
- (2) Hex nut if (1) is a stud or an upside-down screw
- (3) Shims (about 3 mm space for shims)
- (4) Hex nut
- (5) Foundation bracket
- (6) Hex nut
- (7) Hex nut and foundation screw
- (9) Supporting girder
- (10) Shaft end pump (optional)



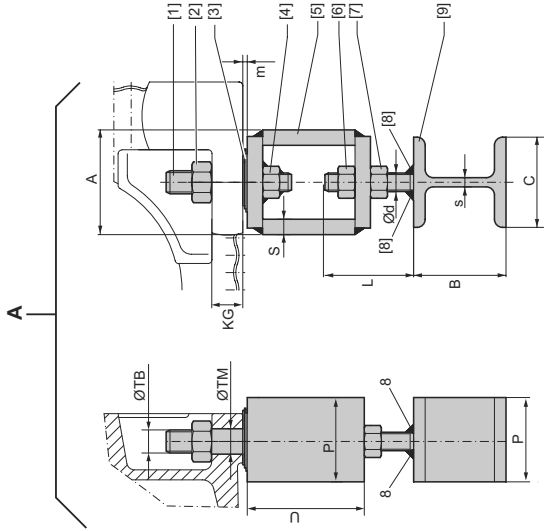
Important for MC.PV. / MC.RV. gear unit types:

- The mounting clearance between bearing cover and gear unit foundation must be at least 40 mm.
- The mounting clearance must be dimensioned adequately if the gear unit is equipped with a shaft end pump [10] (→ Sec. "Shaft end pump")



Concrete base

The concrete base for the gear unit must be reinforced and interlocked with the concrete using steel clamps, steel rods or steel elements. Only the supporting girders are embedded in the concrete (Pos. "A" → following figure).



51404XX

Figure 19: Reinforcing the concrete base (Pos. "A")

- [1] Hex head screw or stud
- [2] Hex nut if [1] is a stud or an upside-down screw
- [3] Shim (about 3 mm space for shims)
- [4] Hex nut
- [5] Foundation bracket
- [6] Hex nut
- [7] Hex nut and foundation screw
- [8] Weld seam
- [9] Supporting girder



Dimensions

Gear unit size	Stud			Foundation frame					Foundation screws			Supporting girders				
	ØTB	ØTM	KG	m	P	U	A	S	Ød	L	P	B	C	s		
02	M20	24	28													
03	M20	24	28													
04	M24	28	34													
05	M24	28	34													
06	M30	33	40	3	120		120	20	M24	120		100		10		
07	M30	33	40													
08	M36	39	52													
09	M36	39	52													



The minimum tensile strength of the supporting girders and foundation screws must be at least 350 N/mm².

Grouting

The density of the grout must be equal to that of the base concrete. The grout is connected with the concrete base using concrete reinforcement steel.

- the concrete base around the supporting girder has dried
- the gear unit with all mount-on components has been aligned to its final position

Tightening torques

Screw / nut	Tightening torque screw / nut [Nm]
M8	19
M10	38
M12	67
M16	160
M20	315
M24	540
M30	1090
M36	1900



Counterflange for
flange mounted
gear units

Gear units can be supplied with a mounting flange on the LSS. Dependent on the bearing configuration, the two flange types are called

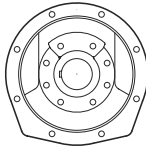
- "Mounting flange"
- "EBD-Mounting flange"

Basically, both flange types are possible for all gear unit designs and mounting positions:

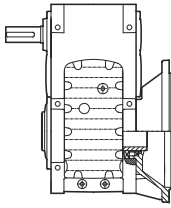
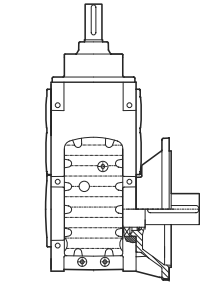
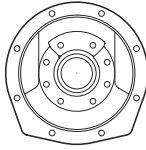
- MC.L..
- MC.V..
- MC.E..

Mounting flange

Solid shaft LSS



Hollow shaft LSS

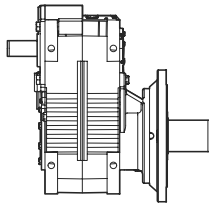


56611AXX

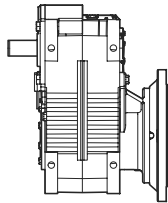
Figure 20: Mounting flange

EBD-Mounting flange

Solid shaft LSS



Hollow shaft LSS



56609AXX

Figure 21: EBD-Mounting flange



The counterflange must have following characteristics:

- Stiff and torsionally rigid, taking into consideration
 - gear unit weight
 - motor weight
 - the torque that has to be transmitted
- additional forces acting on the gear unit from the customer machine (e.g. axial forces from and towards gear unit from a mixing process)
- Horizontal
- Plain
- Vibration isolating, that means no vibrations are to be transmitted from close-by machines and elements
- Not creating resonance vibrations
- A bore with H7-fitting suiting to the centering shoulder of the gear unit flange according to dimension drawing



The mounting surface of mounting flange and counter flange must be absolutely free of grease or oil and from other contamination (e.g. small textile particles, dust,...)

The alignment of the gear unit LSS in relation to the counterflange has to be as accurate as possible. This has an effect on the lifetime of bearing, shafts and coupling.

Allowable misalignments for the coupling on the LSS can be seen in chapter 5.2 or in a separate coupling manual.

Following bolts of the 8.8-class should be used (Tensile strength 640 N/mm²)

Gear unit size MC..	Mounting flange	EBD-Mounting flange
02	8 x M16	16 x M16
03	8 x M16	16 x M16
04	8 x M16	16 x M16
05	8 x M20	16 x M16
06	8 x M20	16 x M20
07	8 x M20	16 x M20
08	8 x M24	16 x M24
09	8 x M24	16 x M24

4.5 Mounting of solid shaft gear units



Before mounting the gear unit, check the foundation dimensions with those in the corresponding drawings in Sec. "Gear unit foundation."

Mount the gear unit in the following order:

1. Mount the components according to Sec. "Gear unit foundation". The shims [3] facilitate later adjustment and, if necessary, to mount a replacement gear unit.
2. Secure the gear unit at the selected positions on the supporting girders using three foundation screws. Position the foundation screws at maximum possible distance (two screws on one side of the gear unit and one on the other side). Align the gear unit as follows:
 - vertically by lifting, lowering or tilting the unit using the nuts of the foundation screws
 - horizontally by tapping the foundation screws slightly into the required direction
3. After having aligned the gear unit, tighten the three nuts of the foundation screws used for alignment. Carefully insert the fourth foundation screw into the supporting girder and tighten it securely. When doing so, make sure that the position of the gear unit does not change. If necessary, realign the gear unit.
4. Tack-weld the ends of the foundation screws to the supporting girders (at least three welding spots per foundation screw). Tack-weld the foundation screws alternately in both directions (starting from the middle) on each side of the center line of the gear unit. This way, misalignment caused by the welding process is avoided. After having tack-welded all screws, they must be welded all the way round in the above mentioned order. Adjust the nuts on the foundation screws to ensure that the welded foundation screws do not twist the gear unit housing.
5. After having tack-welded the nuts of the retaining screws of the gear unit, check the mounting and carry out grouting.
6. When the grouting concrete has set, check the mounting a last time and adjust, if necessary.



Mounting accuracy when aligning

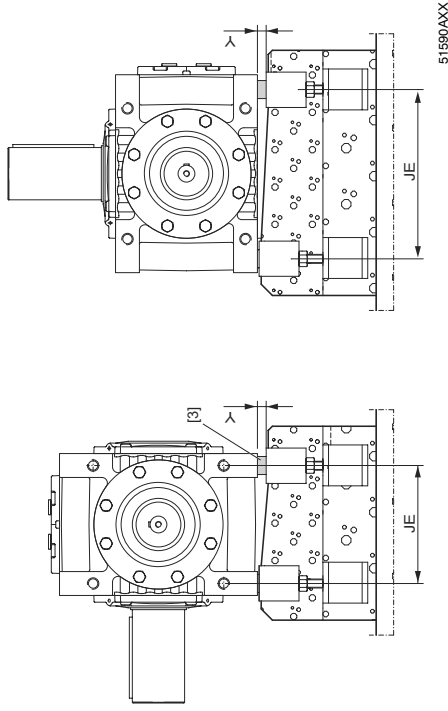


Figure 22: Mounting tolerances of the foundation

When aligning the gear unit, make sure that the mounting tolerances for the evenness of the foundation are not exceeded (values Y_{max} in below table). If necessary, use shims [3] to align the gear unit on the foundation plate.

JE [mm]	Y_{max} [mm]
< 400	0.035
400 ... 799	0.060
800 ... 1200	0.090
1200 ... 1600	0.125

Flange mounted gear units



Before mounting the gear unit, check if the counterflange fulfils the requirements mentioned in Sec. "4.4 Gear unit foundation - Counterflange for flange mounted gear units"

Mount the gear unit in the following order:

1. Lower the gear unit on the counterflange with suitable lifting means. Especially take care of the guidelines mentioned in Sec. 2.1.
2. Secure the gear unit at the right position on the counterflange using the flange bolts and tighten them crosswise with the full tightening torque (→ sec. 4.4).



4.6 Mounting / removing hollow shaft gear units with keyed connection



- Included in the scope of delivery (→ Figure 23):
 - Circlips [3], end plate [4]
- **Not** included in the scope of delivery (→ Figure 23 / Figure 24 / Figure 25):
 - Threaded rod [2], nut [5], retaining screw [6], ejector screw [8]

Selecting the adequate thread and length of the threaded rod as well as the retaining screw depends on the design of the customer's machine.

Thread sizes

SEW-EURODRIVE recommends the following thread sizes:

Gear unit size	Thread size for	
	• threaded rod [2]	• nut (DIN 934) [5] • retaining screw [6]
02 - 06		M24
07 - 09		M30

The thread size of the ejector screw depends on the end plate [4]:

Gear unit size	Thread size of ejector screw [8]	
	02 - 06	M30
07 - 09		M36

Mounting the hollow shaft gear unit onto the customer's shaft

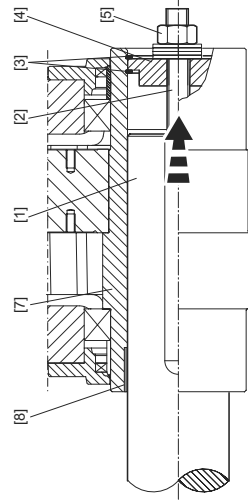


Figure 23: Mounting of hollow shaft gear unit with keyed connection

- [1] Customer's shaft
- [2] Threaded rod
- [3] Circlips
- [4] End plate
- [5] Nut
- [7] Hollow shaft
- [8] Bushing

- To mount and secure the gear unit, attach the circlips [3] and the end plate [4] on the hollow shaft bore.



- Apply NOCO® fluid to the hollow shaft [7] and the shaft end of the customer's shaft [1].
- Push the gear unit onto the customer's shaft [1]. Thread the threaded rod [2] into the customer's shaft [1]. Tighten the customer's shaft [1] with the nut [5] until the shaft end of the customer's shaft [1] and the end plate [4] meet.
- Loosen the nut [5] and unscrew the threaded rod [2]. After having mounted the gear unit, secure the customer's shaft [1] using the retaining screw [6].

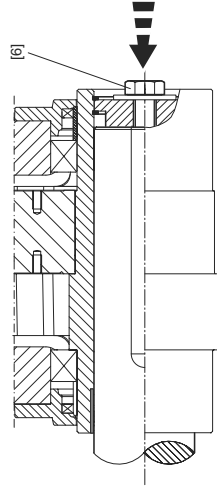


Figure 24: Mounted hollow shaft gear unit with keyed connection

Removing the hollow shaft gear unit from the customer's shaft

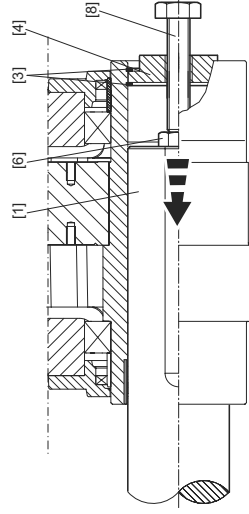


Figure 25: Removing hollow shaft gear unit with keyed connection

- [1] Customer's shaft
- [2] Threaded rod
- [3] Circlips
- [4] End plate
- [5] Nut
- [6] Retaining screw
- [7] Hollow shaft
- [8] Bushing

- Remove the retaining screw [6] (Figure 24, Pos. 6).
- Remove the outer circlip [3] and the end plate [4].
- Thread the retaining screw [6] into the customer's shaft [1].
- Flip the end plate [4] and remount the end plate and the outer circlip [3].
- Thread the ejector screw [8] into the end plate [4] to remove the gear unit from the customer's shaft [1].



4.7 Mounting / removing hollow shaft gear units with shrink disc

A shrink disc serves as connecting element between the hollow shaft of the gear unit and the customer's shaft. For the shrink disc type used (designation: RLK608), refer to section "Identifying shrink disc type"

- Included in the scope of delivery (→ Figure 31):
 - Circlip [3], end plate [4]
- **Not** included in the scope of delivery (→ Figure 31 / Figure 32 / Figure 35):
 - Threaded rod [2], nut [5], retaining screw [6], ejector screw [8]

Selecting the appropriate thread and length of the threaded rod as well as the retaining screw depends on the design of the customer's machine.



Thread sizes

SEW-EURODRIVE recommends the following thread sizes:

Gear unit size	Thread size for	
	threaded rod [2] • nut (DIN 934) [5] • retaining screw [6]	→ Figure 32, 33
02 - 06	M24	
07 - 09	M30	

The thread size of the ejector screw depends on the end plate [4]:

Gear unit size	Thread size of the ejector screw [8]
02 - 06	M30
07 - 09	M36

Normally, the shrink disc type RLK608 is used. It has a metallic colour shade. The letters "RLK 608-..." are engraved:

Identifying shrink disc type



Figure 26: shrink disc type RLK608

- [10] Locking screw
- [11] Forcing thread



Order-specific, other shrink disc types could be used. In this case please refer to the separate, shrink disc-specific manual.



Mounting the shrink disc

- Do not tighten the locking screws [10] before the customer's shaft [1] has been mounted, else the hollow shaft could be deformed!

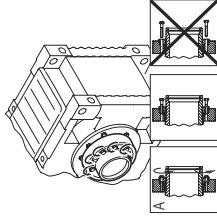


Figure 27: Shrink disc locking screws before customer's shaft mounting

- Slide the shrink disc [9] with untightened screws onto the hub of the hollow shaft bore. Position the customer's shaft [1] in the hollow shaft bore. Next move the shrink disc [9] by dimension A (→ following figure, Sec. "Dimension A") from the shaft end of the hollow shaft:

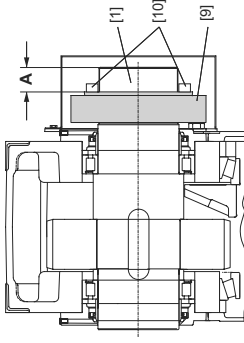


Figure 28: Mounting the shrink disc

- [1] Customer's shaft
- [9] Shrink disc
- [10] Locking screws

It is essential to make sure that the clamping area of the shrink disc is free from grease.

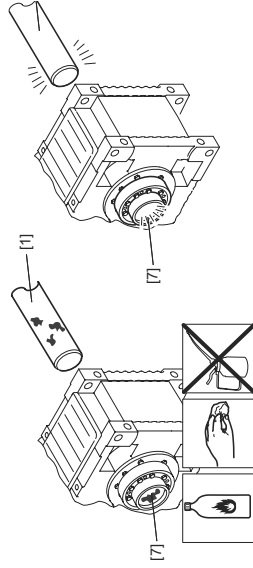


Dimension A

Gear unit size MC..	Shrink disc type RLK608 Dimension A [mm]
02	39
03	45
04	44
05	42
06	44
07	50
08	51
09	49

**Mounting the hollow shaft gear unit onto the customer's shaft**

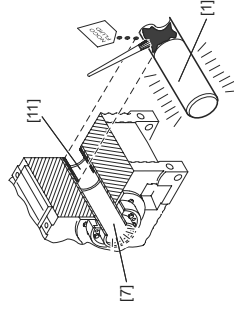
- Before mounting the gear unit, degrease the hollow shaft bore and the customer's shaft [1].



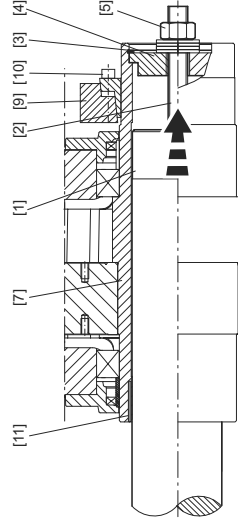
56820AXX

Figure 29: Degrease of hollow shaft bore and customer's shaft

- Apply a small amount of NOCO® fluid on the customer's shaft to the area of the bushing [11].

56811AXX
Figure 30: Application of NOCO® fluid on customer's shaft

Never apply NOCO® fluid directly to the bushing as the paste may be able to get into the clamping area of the shrink disk when the input shaft is put on.

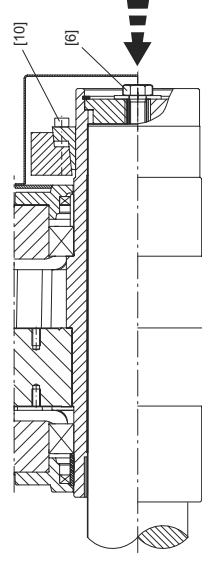


56816AXX

Figure 31: Mounting of hollow shaft gear unit with shrink disc

- [1] Customer's shaft
- [2] Threaded rod
- [3] Circlip
- [4] End plate
- [5] Nut
- [7] Hollow shaft
- [9] Shrink disc
- [10] Locking screws
- [11] Bushing

- To mount and secure the gear unit, attach the circlips [3] and the end plate [4] on the hollow shaft bore.
- Push the gear unit onto the customer's shaft [1]. Thread the threaded rod [2] into the customer's shaft [1]. Tighten the customer's shaft [1] with the nut [5] until the shaft end of the customer's shaft [1] and the end plate [4] meet.
- Loosen the nut [5] and unscrew the threaded rod [2]. After having mounted the gear unit, secure the customer's shaft [1] using the retaining screw [6].



56817AXX

Figure 32: Mounted hollow shaft gear unit with shrink disc, shrink disc unclamped



Tightening shrink disc type RLK608

Tighten the locking screws by hand whilst aligning the shrink disc. Tighten the clamping screws one by one in a clockwise direction (not crosswise) by only 1/4 revolution each.

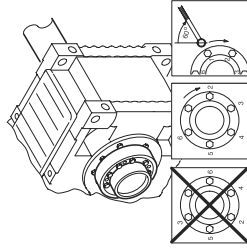


Figure 33: Order of locking screws tightening

56812AXX

The screws of shrink discs with slitted cone bushing has to be tightened in that way that you start with the screw on one side of the slit and continue with the screw on the other side of the slit.



Continue tighten the screws by 1/4 revolution in several stages until the screw- side faces of the outer ring and the inner ring are in line like shown in Figure 34.

The assembly is defined by the axial movement of the cone bushing and can be done without a torque wrench.

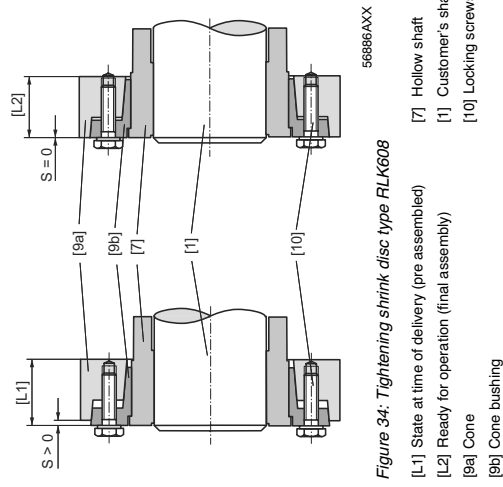


Figure 34: Tightening shrink disc type RLK608

56886AXX

- [L1] State at time of delivery (pre assembly)
- [L2] Ready for operation (final assembly)
- [9a] Cone bushing
- [9b] Cone bushing
- [7] Hollow shaft
- [1] Customer's shaft
- [10] Locking screws



Removing the shrink disc

Loosen the locking screws [10] by 1/4 revolution each in sequence in several levels evenly, so that tilting of the clamping surface is avoided.

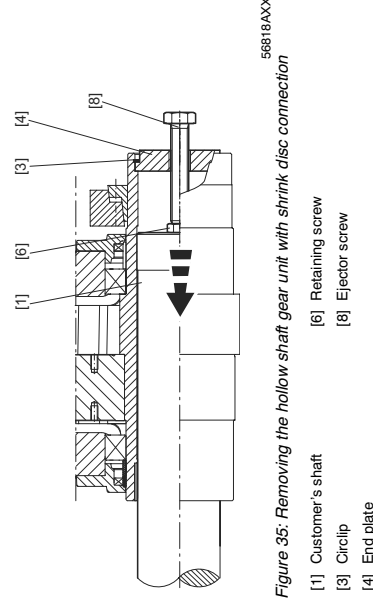


Never unscrew the locking screws completely from the tapped hole, since otherwise danger of accident exists.

If the cone bushing and cone ring do not loosen from each other by themselves: Take the required quantity of locking screws and bolt them evenly into the removing thread bores. Tighten the locking screws in several levels until the cone bushing is separated from the cone ring.

Take the shrink disc off from the hollow shaft.

Removing the hollow shaft gear unit from the customer's shaft



56818AXX

Figure 35: Removing the hollow shaft gear unit with shrink disc connection

- [1] Customer's shaft
- [3] Circlip
- [4] End plate
- [6] Retaining screw
- [8] Ejector screw

- Remove the retaining screw [Figure 32, Pos. 6].
- Remove the outer circlip [3] and the end plate [4].
- Thread the retaining screw [6] into the customer's shaft [1].
- Flip the end plate [4] and remount the end plate and the outer circlip [3].
- Thread the ejector screw [8] into the end plate [4] to remove the gear unit from the customer's shaft [1].

Cleaning and Lubrication

- Clean the shrink disk after the disassembly and
- grease afterwards the locking screws [10] on the thread and under the head with paste which consist MoS₂, e.g. "gleitmo 100" from FUCHS LUBRITECH (www.fuchs-lubritech.de).
- Coat the conical surfaces and the screw-side face of the cone bushing with a thin film (0.01 ... 0.02 mm) with the solid film lubricant "gleitmo 900" from FUCHS LUBRITECH (www.fuchs-lubritech.de) or with an equal product from other supplier.

Spray the solid film lubricant on the surface till the color of the solid film lubricant is just thick enough to cover the surface (in this case the thickness will be about 0.01 ... 0.02 mm)





4.8 Mounting a motor with motor adapter

Motor adapters [1] are available for mounting IEC motors of sizes 132 to 315 to industrial gear units of the MC series.

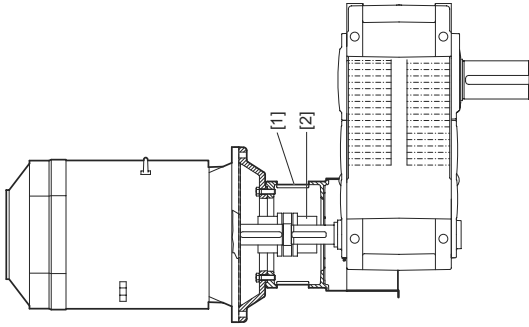


Figure 36: Motor adapter for MC.P.. industrial gear units

- [1] Motor adapter
- [2] Coupling

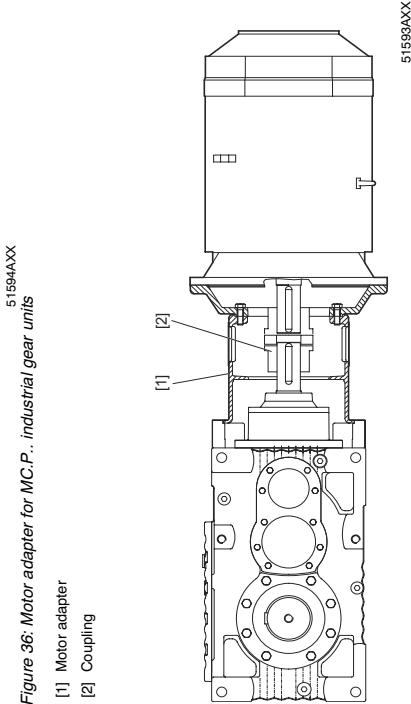


Figure 37: Motor adapter for MC.R.. industrial gear units

- [1] Motor adapter
- [2] Coupling



For mounting couplings [2], refer to the notes in Sec. "Mounting of couplings."



When selecting a motor, **take into account the permitted motor weight, the gear unit design and the type of gear unit mounting** according to the following tables.

The following applies to all tables:

G_M = Motor weight G_G = Gear unit weight

Mounting type	Series / Industrial gear unit design	
Foot-mounted	MC.PL..	$G_M \leq G_G$
	MC.RL..	$G_M \leq G_G$
Shaft-mounted		$G_M \leq 0.5G_G$
Flange-mounted		$G_M \leq 0.5G_G$

Mounting type	Series / Industrial gear unit design	
Foot-mounted	MC.PV..	$G_M \leq 1.5G_G$
	MC.RV..	$G_M \leq G_G$
Shaft-mounted		$G_M \leq G_G$
Flange-mounted		$G_M \leq 0.75G_G$

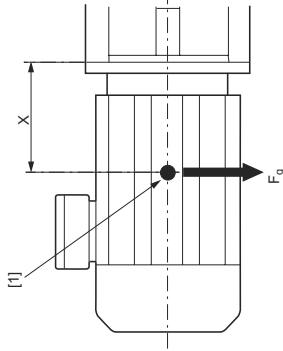
Mounting type	Series / Industrial gear unit design	
Foot-mounted	MC.PE..	$G_M \leq G_G$
	MC.RE..	$G_M \leq 1.5G_G$
Shaft-mounted		$G_M \leq G_G$
Flange-mounted		$G_M \leq G_G$

These tables are only valid for stationary operation. If gear unit is moving during (e.g. travel drives) please contact SEW-EURODRIVE.





These tables only apply to the following correlation of motor size/weight F_q and dimension "x".



56753AXX

[1] Center of gravity of the motor

Motor size		F_q	x
IEC	NEMA	[N]	[mm]
132S	213/215	579	189
132M	213/215	677	208
160M	254/286	1059	235
160L	254/286	1275	281
180M	254/286	1619	305
180L	254/286	1766	305
200L	324	2354	333
225S	365	2943	348
225M	365	3237	348
250M	405	4267	395
280S	444	5984	433
280M	445	6475	433
315S	505	8142	485
315M	505	8927	485
315L		11772	555

The maximum approved weight of the attached motor F_q has to be reduced in a linear manner if the center of gravity distance x is increased. F_{qmax} cannot be increased if the center of gravity distance is reduced.

Contact SEW-EURODRIVE in the following cases:

- When retrofitting motor adapters with a cooling air fan (not for motors of sizes 132S and 132M).
- If motor adapter is removed, re-alignment is necessary.



5 Mechanical Installation Options

5.1 Important Installation Instructions

Disconnect the motor from the power supply before starting work and secure it against unintentional restart!



Important Installation notes



- Only use a mounting device for installing input and output elements. Use the center bore and the thread on the shaft end for positioning purposes.
- **Never mount couplings, pinions, etc. onto the shaft end by hitting them with a hammer (damage to bearings, housing and the shaft!).**
- **Observe correct tension of the belt for belt pulleys (in accordance with manufacturer's specifications).**
- Power transmission elements should be balanced after insertion and must not give rise to any impermissible radial or axial forces.

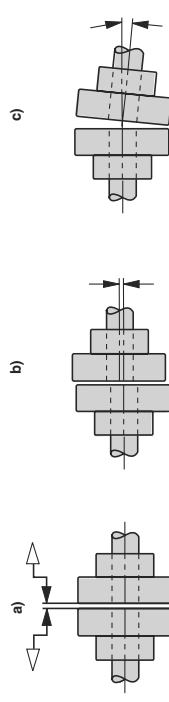


Note:

Installation is easier if you first apply lubricant to the output element or heat it up briefly (to 80-100°C).

Adjust the following misalignments when mounting couplings:

- Axial misalignment (maximum and minimum clearance)
- Offset misalignment (concentric running fault)
- Angular misalignment



03356AXX

Figure 38: Clearance and misalignment when mounting the coupling

Input and output elements such as couplings must be equipped with a protection cover!



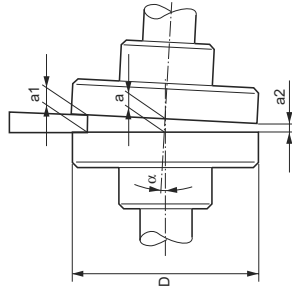


Note:

The following methods for measuring angular and axial misalignment are important for complying with the mounting tolerances specified in Sec. "Mounting of couplings"!

Measuring of angular misalignment with a feeler gauge

The following figure shows the measurement for angular misalignment (α) using a feeler gauge. When using this method, an accurate result is only achieved when the deviation of the coupling faces is eliminated by turning both coupling halves by 180° and the average value is then calculated from the difference ($a_1 - a_2$).

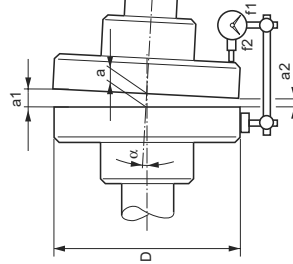


520659AXX

Figure 39: Measuring angular misalignment using a feeler gauge

Measuring of angular misalignment using a micrometer dial

The following figure shows the measurement for angular misalignment using a micrometer dial. This measuring method provides the same result as described under "Measuring angular offset with a feeler gauge" if the coupling halves are rotated together, for instance with one coupling pin, so that the needle of the micrometer dial does not move noticeably on the measuring surface.



520644AXX

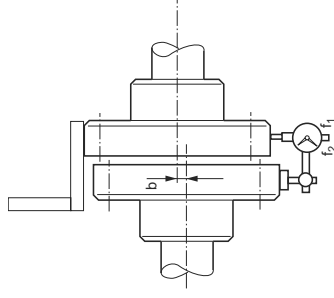
Figure 40: Measuring angular misalignment using a micrometer dial

A prerequisite for this measuring method is that there is no axial play in the shaft bearings when the shafts rotate. If this condition is not fulfilled, the axial play between the faces of the coupling halves must be eliminated. As an alternative, you can use two micrometer dials positioned on the opposite sides of the coupling (to calculate the difference of the two micrometer dials when rotating the coupling).



Measuring of offset misalignment using straight-edge and micrometer dial

The following figure shows the measurement for offset misalignment using a straight-edge. Permissible values for eccentricity are usually so small that the best measurement results can be achieved with a micrometer dial. If you rotate one coupling half together with the micrometer dial and divide the deviation by two, the micrometer dial will indicate the deviation and as a result the misalignment (dimension "b"), which includes the offset misalignment of the other coupling half.

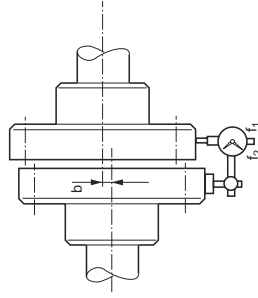


52065AXX

Figure 41: Measuring offset misalignment using straight-edge and micrometer dial

Measuring of offset misalignment using a micrometer dial

The following figure shows the measurement for offset misalignment using a more accurate measuring method. The coupling halves are rotated together without the tip of the micrometer dial moving on the measuring surface. The offset misalignment is obtained by dividing the deviation indicated on the micrometer dial (dimension "b").



52066AXX

Figure 42: Measuring offset misalignment using a micrometer dial



5.2 Mounting of couplings
ROTEX coupling

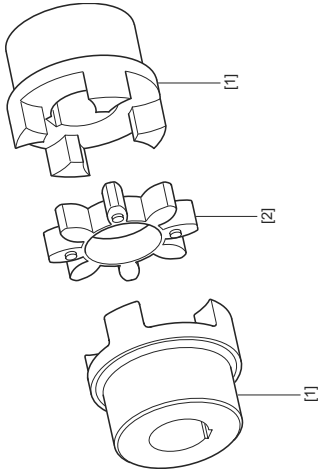


Figure 43: Design of the ROTEX coupling

- [1] Coupling hub
- [2] Ring gear

The low-maintenance, elastic ROTEX coupling is capable of compensating radial and angular misalignment. Careful and exact alignment of the shaft ensures long service life of the coupling.



Mounting the coupling halves onto the shaft

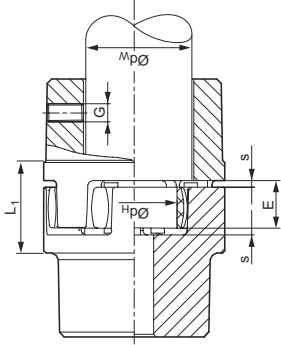


Figure 44: Mounting dimensions of the ROTEX coupling

Coupling size	Mounting dimensions						Locking screw	
	E [mm]	s [mm]	d _H [mm]	d _W [mm]	L ₁ (Alu / GG / GGG) [mm]	L ₁ (steel) [mm]	G	Tightening torque [Nm]
14	13	1.5	10	7	-	-	M4	2.4
19	16	2	18	12	26	-	M5	4.8
24	18	2	27	20	30	-	M5	4.8
28	20	2.5	30	22	34	-	M6	8.3
38	24	3	38	28	40	60	M8	20
42	26	3	46	36	46	70	M8	20
48	28	3.5	51	40	50	76	M8	20
55	30	4	60	48	56	86	M10	40
65	35	4.5	68	55	63	91	M10	40
75	40	5	80	65	72	104	M10	40
90	45	5.5	100	80	83	121	M12	69
100	50	6	113	95	92	-	M12	69
110	55	6.5	127	100	103	-	M16	195
125	60	7	147	120	116	-	M16	195
140	65	7.5	165	135	127	-	M20	201
160	75	9	190	160	145	-	M20	201
180	85	10.5	220	185	163	-	M20	201



The shaft distance must be strictly observed (dimension E) to ensure axial play of the coupling.

Mounting dimensions
ROTEX coupling in
motor adapter

Tighten the set screws (A) to avoid axial play of the coupling.

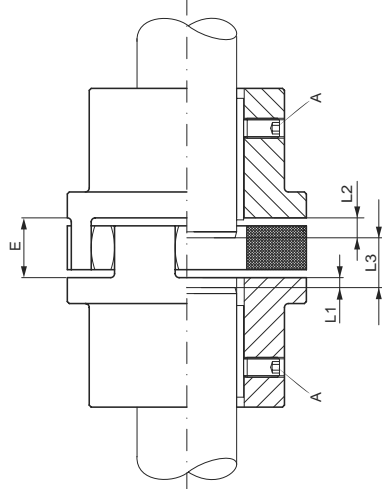


Figure 45: Mounting dimensions of the ROTEX coupling at the HSS (input shaft) – motor adapter



The mounting dimensions specified in the following table only apply to mounting a ROTEX coupling in a motor adapter. They apply to all gear unit versions and gear ratios.

ROTEX coupling size	IEC motor size	E [mm]	Mounting dimensions		
			L ₁ [mm]	L ₂ [mm]	L ₃ [mm]
R28/38	132	20	0	-17	3
R38/45	160	24	1	0	25
R42/55	180/200	26	-1	0	25
R48/60	225	28	0	-3	25
R55/70	225	30	0	-6	25
R65/75	250/280	35	0	-10	25
R75/90	315	40	0	-15	25
R90/100	315	45	-20	0	25

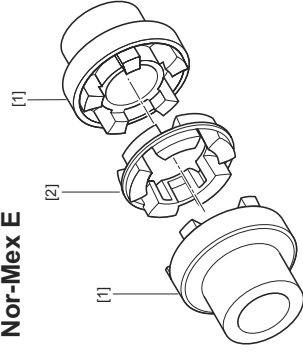


The shaft distance must be strictly observed (dimension E) to ensure axial play of the coupling.

Nor-Mex coupling, types G and E

The low-maintenance Nor-Mex couplings types G and E are torsionally flexible couplings capable of compensating axial, angular, and radial shaft misalignments. Torque is transmitted via an elastic element with high damping properties, which is also oil and heat resistant. The couplings can be used for either direction of rotation and can be mounted in any position. The design of the Nor-Mex coupling type G allows to replace the elastic element [5] without movement of the shafts.

Nor-Mex E



Nor-Mex G

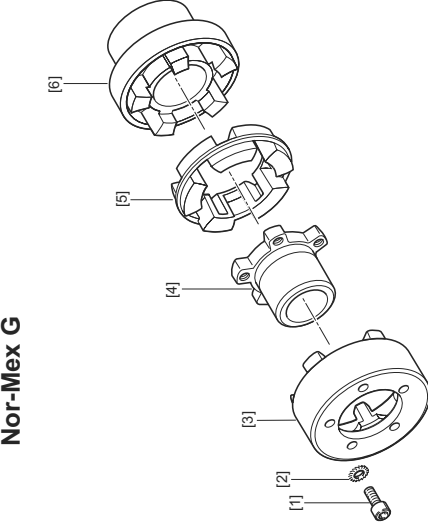


Figure 46: Design of the Nor-Mex E / Nor-Mex G coupling

- [1] Coupling hub
- [2] Elastic element
- [3] Socket head screw
- [4] Washer
- [5] Claw ring
- [6] Flange hub
- [7] Elastic element
- [8] Coupling hub

51687/AXX



Mounting instructions, mounting dimensions for Nor-Mex G couplings

After having mounted the coupling halves, ensure that the recommended play (dimension S_2 for type G, dimension S_1 for type E) and the overall length (dimension L_G for type G and dimension L_E for type E) corresponds with the dimensions given in the following tables. Accurate alignment of the coupling (→ Sec. 'Mounting tolerances') ensures long service life.

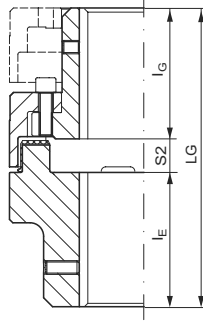


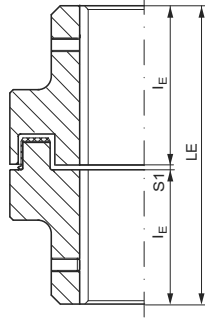
Figure 47: Mounting dimensions of the Nor-Mex G coupling

5167/4XXX

Nor-Mex G Coupling size	Mounting dimensions				Weight [kg]
	I_E [mm]	I_G [mm]	L_G [mm]	Permitted tolerance S_2 [mm]	
82	40	40	92	12±1	1.85
97	50	49	113	14±1	3.8
112	60	58	133	15±1	5
128	70	68	154	16±1	7.9
148	80	78	176	18±1	12.3
168	90	87	198	21±1.5	18.3
194	100	97	221	24±1.5	26.7
214	110	107	243	26±2	35.5
240	120	117	267	30±2	45.6
265	140	137	310	33±2.5	65.7
295	150	147	334	37±2.5	83.9
330	160	156	356	40±2.5	125.5
370	180	176	399	43±2.5	177.2
415	200	196	441	45±2.5	249.2
480	220	220	485	45±2.5	352.9
575	240	240	525	45±2.5	517.2



Mounting dimensions of the Nor-Mex E coupling



5167/4XXX

Figure 48: Mounting dimensions of the Nor-Mex E coupling

Nor-Mex E Coupling size	Mounting dimensions				Weight [kg]
	I _E [mm]	LE [mm]	Permitted tolerance S ₁ [mm]		
67	30	62.5	2.5±0.5		0.93
82	40	83	3±1		1.76
97	50	103	3±1		3.46
112	60	123.5	3.5±1		5
128	70	143.5	3.5±1		7.9
148	80	163.5	3.5±1.5		12.3
168	90	183.5	3.5±1.5		18.4
194	100	203.5	3.5±1.5		26.3
214	110	224	4±2		35.7
240	120	244	4±2		46.7
265	140	285.5	5.5±2.5		66.3
295	150	308	8±2.5		84.8
330	160	328	8±2.5		121.3
370	180	368	8±2.5		169.5
415	200	408	8±2.5		237
480	220	448	8±2.5		320
575	240	488	8±2.5		457



Mounting dimensions of the Nor-Mex coupling type G in the motor adapter

Tighten the set screws (A) to avoid axial play of the coupling.

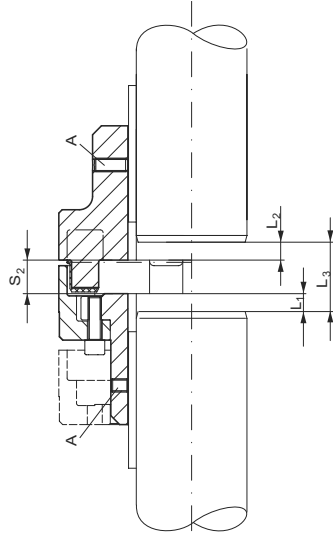


Figure 49: Mounting dimensions of the Nor-Mex coupling on the HSS (input shaft) – motor adapter

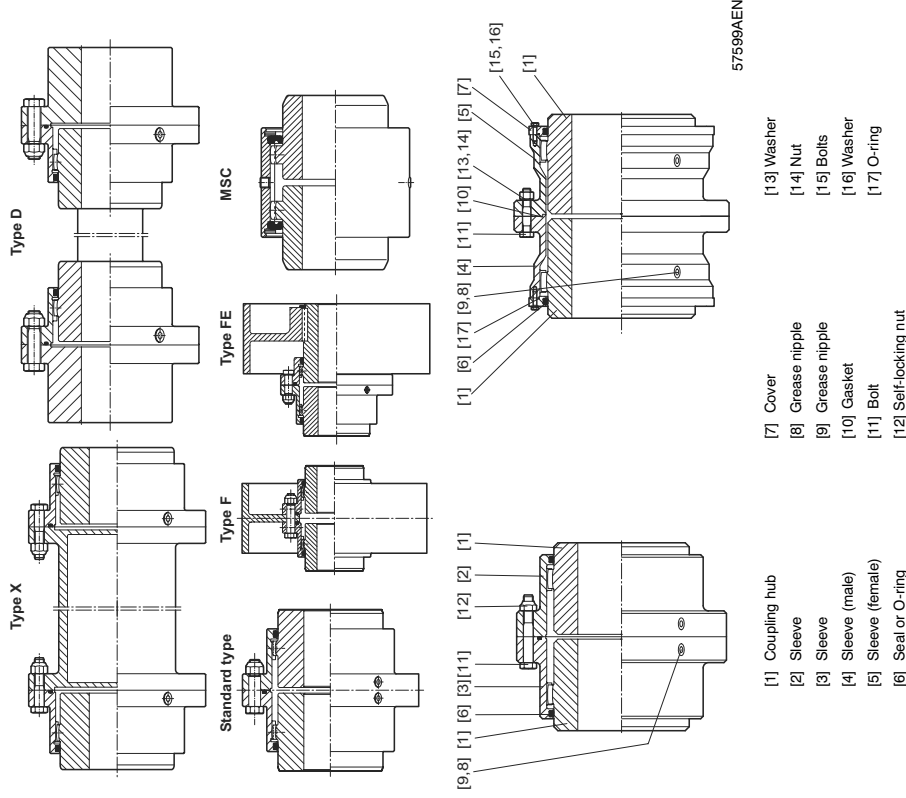


The mounting tolerances specified in the following table only apply to mounting a Nor-Mex coupling in a motor adapter.

NOR-MEX coupling size G.		97	97	112	128	148	168	194	214
Gear unit size Gear ratio i	Mounting dimension	[mm]							
		132	160	160/180	200	225	250/280	280/315	315
All All	S ₂	14	14	15	16	18	21	24	26
	L ₃	3	25	25	25	25	25	25	25
	L ₂	-	5	5	5	10	2	1	0
	L ₁	-	6	5	4	-3	2	0	-1
MC3R05 i = 14 ... 63	L ₂	-	5	5	5	4	2	5	0
	L ₁	-	6	5	4	3	2	-4	-1
MC3R08 i = 14 ... 63	L ₂	-	5	5	5	4	2	1	5
	L ₁	-	6	5	4	3	2	1	-6
Other MC.. i = 7.1 ... 112	L ₂	-5	5	5	5	4	2	1	0
	L ₁	-6	6	5	4	3	2	0	-1



Flexible jaw couplings MT, MS-MTN series
Mounting



- [1] Coupling hub
- [2] Sleeve
- [3] Sleeve
- [4] Sleeve (male)
- [5] Sleeve (female)
- [6] Seal or O-ring
- [7] Cover
- [8] Grease nipple
- [9] Grease nipple
- [10] Gasket
- [11] Bolt
- [12] Self-locking nut
- [13] Washer
- [14] Nut
- [15] Bolts
- [16] Washer
- [17] O-ring

1. Ensure that all parts are clean.
2. Apply a light coat of grease to the O-rings [6] and place them into the grooves of the sleeves [2,3 or 4,5].
3. Apply grease onto the sleeve teeth [2,3 or 4,5]. Place the sleeves onto the shafts without damaging the O-rings [6].

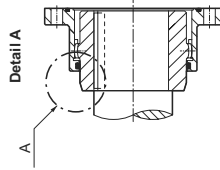


4. For couplings larger than the MS-325 or MT-260 types, you have to grease the O-rings or seals [6] before inserting them in the grooves of the cover [7]. Next, place the covers [7] onto the shafts.



Before installing the hubs [1], heat them but do not exceed 110 °C. Do not use an open flame burner.

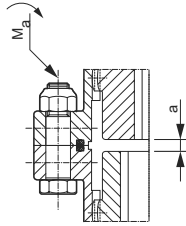
5. Install the hubs [1] on their respective shaft with the longest chamfer hub end towards the machine bearing (see detail A). Hub faces have to be flush with the shaft end.



57602AEN

6. Align the shafts to be connected with the coupling hubs and check the spacing "a" between the hubs (see detail B). Refer to the table on page 73) for the according values..

Detail B



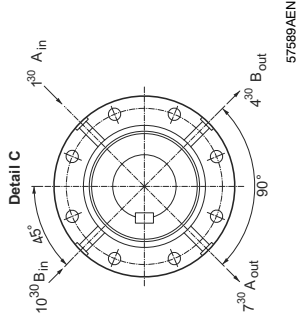
57604AEN

7. Align the two shafts. Check for correct alignment using a dial indicator. The alignment precision depends on the running speed.
8. Allow the hubs [1] to cool before tightening the sleeves [2, 3 or 4, 5] over the hubs. Before installing the sleeves [2, 3 or 4, 5], apply grease onto the coupling hub teeth [1].
9. Install the O-ring [10] and tighten the sleeves to the recommended tightening torque (see detail B). It is recommended to grease the O-ring. Make sure that the flange lubrication holes are positioned at an angle of 90° to each other.



10. To fill the grease, remove both plugs [9] from the sleeve [9]. Next, proceed as follows:

Turn the coupling in such a way that the flange lubrication holes are in 1:30, 4:30, 7:30, 10:30 o'clock positions if the coupling were seen as a clock face. Remove the 1:30 and 7:30 position plugs [9] and pump grease into the 1:30 position holes until grease leaks out from the lower 7:30 position hole (see detail C). During this process it is recommended to remove the 10:30 position plug to vent the inside. For grease quality and more accurate quantity, → Section Recommended Lubrication and Quantity. If running conditions differ from those in → Section Recommended Lubrication and Quantity, consult SEW. For HAD, MTD, MSD, MTX, MSXL, HAXL, MTCO and MSCO types, each coupling half must be lubricated separately. For MS-, VS, MTV types, consult SEW.



57589AEN

Maintenance

Every 3000 operating hours.

If longer intervals are required, contact SEW. Proceed as mentioned under 11.

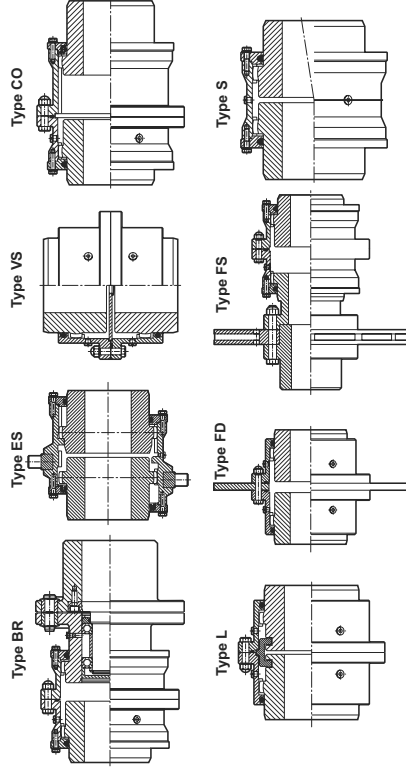
Disassembly and condition check

Every 8000 operating hours or every 2 years.

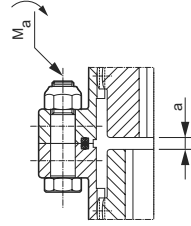
1. Before moving the sleeves, clean the hub surfaces near the O-rings [6] free from rust or dirt.
2. Remove the bolts [11] and the O-ring [10].
3. Check the gearing and sealing.
4. Check for correct alignment.



Mounting tolerance



57587ADE



57586AXX

MT, MS and MTN types					
Size	a [mm]	Size	a [mm]	Size	a [mm]
MT-MTN-42, MS-5	6±1	MT-MTN-205, MS-430	12±3	MT-460, MS-MN-5250	20±4
MT-MTN-55, MS-10	6±1	MT-MTN-230, MS-600	12±3	MT-500, MS-MN-6500	25±4
MT-MTN-70, MS-20	6±2	MT-MTN-260, MS-800	12±3	MT-550, MS-MN-9500	25±4
MT-MTN-90, MS-35	8±2	MT-280, MS-MN-1150	16±3	MT-590, MS-MN-11000	25±4
MT-MTN-100, MS-60	8±2	MT-310, MS-MN-1500	16±3	MT-620, MS-MN-13500	30±6
MT-MTN-125, MS-105	8±2	MT-345, MS-MN-2100	16±3	MT-650, MS-MN-17000	30±6
MT-MTN-145, MS-150	10±2	MT-370, MS-MN-2650	20±4	MT-680, MS-MN-19000	30±6
MT-MTN-165, MS-210	10±3	MT-390, MS-MN-3400	20±4	MT-730, MS-MN-22500	30±6
MT-MTN-185, MS-325	10±3	MT-420, MS-MN-4200	20±4	MT-800, MS-MN-27000	30±6



MT and MS-MTN types					
Size	Size Tightening Torque M _A [Nm]	Size	Size Tightening Torque M _A [Nm]	Size	Size Tightening Torque M _A [Nm]
MT-42	8	MT-205	325	MT-460, MS-MN-5250	760
MT-55	20	MT-230	325	MT-500, MS-MN-6500	1140
MT-70	68	MT-26	565	MT-550, MS-MN-9500	1140
MT-90	108	MT-280, MS-MN-1150	375	MT-590, MS-MN-11000	1140
MT-100	108	MT-310, MS-MN-1500	375	MT-620, MS-MN-13500	1800
MT-125	230	MT-345, MS-MN-2100	660	MT-650, MS-MN-17000	1800
MT-145	230	MT-370, MS-MN-2650	660	MT-680, MS-MN-19000	1800
MT-165	230	MT-390, MS-MN-3400	760	MT-730, MS-MN-22500	1800
MT-185	325	MT-420, MS-MN-4200	760	MT-800, MS-MN-27000	1800

MS-MTN types			
Size	Size		Size
	Tightening Torque M _A [Nm]	Size	
MS-5, MTN-42	20	MS-150, MTN-145	108
MS-10, MTN-55	39	MS-210, MTN-165	108
MS-20, MTN-70	39	MS-325, MTN-185	325
MS-35, MTN-90	68	MS-430, MTN-205	325
MS-60, MTN-100	68	MS-600, MTN-230	325
MS-105, MTN-125	68	MS-800, MTN-260	375



Recommended
Lubricants and
Quantity

	Company	Oil
Normal operation conditions	Amoco	Amoco coupling grease
	Castrol	Spheerol BN 1
	Cepsa-Kraftt	KEP 1
	Esso-Exxon	Unirex RS 460, Pen-o- Led EP
	Fina	Cerlan EP-0
	Klüber	Klüberplex GE 11-680
	Mobil	Mobilgrease XTC, Mobiltemp SHC 460 special
	Shell	Shell Albida GC1
	Texaco	Coupling grease KP 0/1 K-30
	Verkol	Verkol 320-1 Grado 1
Normal speed and heavy duty operation	Klüber	Klüberplex GE 11-680
	Texaco	Coupling grease KP 0/1 K-30
	Amoco	Coupling grease
HIGH SPEED ¹⁾	Esso-Exxon	Unirex RS-460
	Klüber	Klüberplex GE 11-680
	Mobil	Mobilgrease XTC
	Texaco	Coupling grease KP 0/1 K-30

1) Circumferential speed > 80 m/s

Greases for operation between 0°C and 70°C.

The couplings are supplied with a protective grease only, which is not sufficient for normal operation.

Before mounting the coupling, apply approx. 70 % of the grease quantity manually between hub and sleeve teeth as well as to the surrounding area. After mounting, press the remaining 30 % of the grease into the flange lubrication holes.

Class NLGI 0 grease is recommended for speeds below 300 rpm and NLGI 00 for very low speeds. In both cases, the greases must have good adherence. More frequent lubrication intervals than advised in this operating instructions are required for high temperatures, low speeds, and reversing drives.



MT type				
Size	Quantity ¹⁾ [kg]	Size	Quantity ¹⁾ [kg]	Size
MT-42	0.04	MT-205	2.20	MT-460
MT-55	0.06	MT-2300	2.80	MT-500
MT-70	0.17	MT-260	4.50	MT-550
MT-90	0.24	MT-280	3.00	MT-590
MT-100	0.36	MT-310	3.60	MT-620
MT-125	0.50	MT-345	4.50	MT-650
MT-145	0.70	MT-370	5.00	MT-680
MT-165	1.30	MT-390	9.00	MT-730
MT-185	1.75	MT-420	9.80	MT-800

1) Quantity per complete coupling types MT, MTCL, MTL, MSL, MTK, MSK, MTBR, MSBR, MTFD, MSFD, MTF, MSF, MTB, MTST-B, MTN.

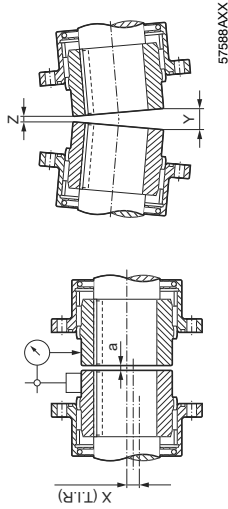
MS and MN type				
Size	Quantity ¹⁾ [kg]	Size	Quantity ¹⁾ [kg]	Size
MS-5, MTN-42	0.07	MS-430, MTN-205	1.60	MS-MN-5250
MS-10, MTN-55	0.10	MS-600, MTN-230	2.00	MS-MN-6500
MS-20, MTN-70	0.12	MS-800, MTN-260	2.00	MS-MN-9500
MS-35, MTN-90	0.22	MS-MN-1150	3.40	MS-MN-11000
MS-60, MTN-100	0.30	MS-MN-1500	3.66	MS-MN-13500
MS-105, MTN-125	0.40	MS-MN-2100	4.60	MS-MN-17000
MS-150, MTN-145	0.60	MS-MN-2650	5.30	MS-MN-19000
MS-210, MTN-165	1.00	MS-MN-3400	8.20	MS-MN-22500
MS-325, MTN-185	1.10	MS-MN-4200	8.60	MS-MN-27000

1) Quantity per complete coupling types MT, MTCL, MTL, MSL, MTK, MSK, MTBR, MSBR, MTFD, MSFD, MTF, MSF, MTB, MTST-B, MTN.

For types MTD, MSD, HAD, MTX, MSX, HAX, MSXL, MTXL, MTBRX, MSBRX, MTSR-P, apply the given quantity divided by 2 to each coupling half. Example: MTX-125, 0.25 kg for each half. For types MSS, MTS, MSC, MTCO, MSCO, MTES, vertical couplings and disengaging couplings, consult our Technical Department



Alignment precision



57568AXX

Types		Speed [rpm]											
		0-250		250-500		500-1000		1000-2000		2000-4000			
MT	MS-MN	x _{max}	(y-z)	x _{max}	(y-z)	x _{max}	(y-z)	x _{max}	(y-z)	x _{max}	(y-z)	x _{max}	(y-z)
		[mm]											
42-90	5-35	0.25	0.25	0.25	0.25	0.25	0.25	0.15	0.20	0.08	0.10		
100-185	60-325	0.50	0.60	0.50	0.60	0.25	0.35	0.15	0.20	0.08	0.10		
205-420	430-4200	0.90	1.00	0.50	0.75	0.25	0.35	0.15	0.20	-	-		
420-	5250-	1.50	1.50	1.0	1.00	0.50	0.50	-	-	-	-		



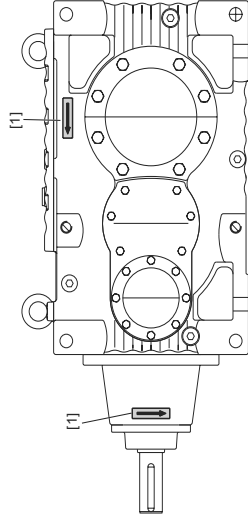
5.3 Backstop FXM

The purpose of a backstop is to prevent undesirable reverse rotation. During operation, the backstop permits rotation in one specified direction of rotation only.

- **Do not start up the motor in blocking direction. Ensure correct connection of power supply with motor to achieve the desired direction of rotation! Running the motor in blocking direction might destroy the backstop!**
- **Contact SEW-EURODRIVE if you want to alter the blocking direction!**



The maintenance-free FXM type backstop is a centrifugally operated backstop with sprags that lift off. Once the lift-off speed is reached, the sprags completely lift off from the contact surface of the outer ring. The backstop is lubricated with gear oil. An arrow on the gear unit housing indicates the permitted direction of rotation [1] (→ following figure).



51639AXX

Figure 50: Arrow on the gear unit housing indicating the permitted direction of rotation

Changing the direction of rotation

To change the direction of rotation, turn the inner ring with the sprags by 180°. Pull out the inner ring with the sprags using a pulling-off device (not included in the scope of delivery) and replace turned by 180°.



... backstop
mounted outside
the gear unit

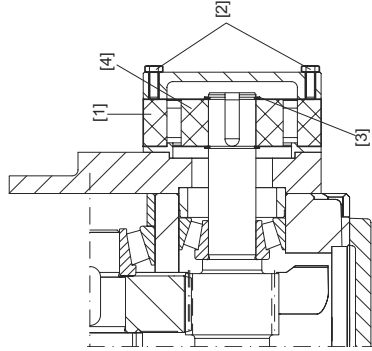


Figure 51: Changing the direction of rotation with backstop mounted outside the gear unit

51640AXX

- [1] Outer ring
- [2] Retaining screws
- [3] Circclip
- [4] Inner ring with cage and sprags

- Drain the gear oil (→ Sec. "Inspection and Maintenance").
- Loosen the retaining screws [2] of the backstop.
- Remove the outer ring [1]. To facilitate dismounting, slightly turn the outer ring [2] in freewheeling direction.
- Remove circclip [3], and inner ring with cage and sprags [4].
- Turn the inner ring [4] with the sprags by 180° and replace the parts in reverse order. When mounting the backstop, do not apply pressure to the cage with the sprags but to the inner ring [4] only. Use the threaded holes on the inner ring [4] for mounting.
- Lock the inner ring [4] with the circclip [3] in axial direction. Mount the outer ring [1] using the retaining screws [2]. Observe the tightening torques specified in the table below:

Screw size	Tightening torque [Nm]
M5	6
M6	10
M8	25
M10	48
M12	84
M16	206
M20	402
M24	696
M30	1420

- Alter the direction arrow on the gear unit housing (Figure 50).
- Refill the gear oil (→ Sec. Lubricants). Check the oil level.
- After mounting, check that the backstop runs smoothly.



... with backstop
mounted inside the
gear unit

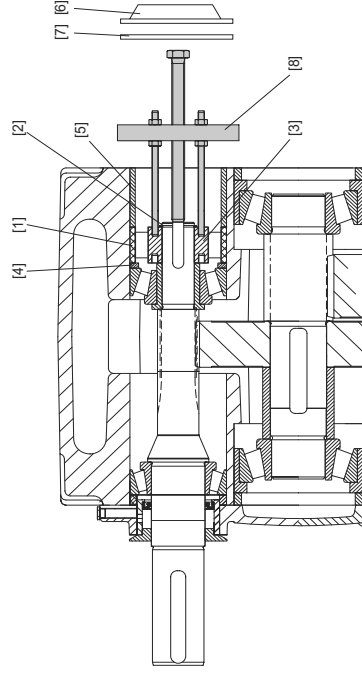


Figure 52: Changing the direction of rotation with backstop mounted inside the gear unit

51645AXX

- [1] Outer ring
- [2] Circclip
- [3] Inner ring with cage and sprags
- [4] Spacer
- [5] Sleeve
- [6] Bearing cover
- [7] Shims
- [8] Pulling-off device

- Drain the gear oil (→ Sec. "Inspection and Maintenance").
- Remove bearing cover [6], shims [7] and sleeve [5]. It is important that shims [7] and sleeve [5] between bearing cover [6] and outer ring [1] are not mixed up because they must be assembled in the correct order.
- Remove the circclip [2] from the input shaft.
- Remove the inner ring with the cage and the sprags [3] using a suitable pull-off device [8]. Use the threaded holes on the inner ring [3] for removal.
- Turn the inner ring [3] with the sprags by 180° and replace the parts in reverse order. When mounting the backstop, do not apply pressure to the cage with the sprags but to the inner ring [3] only.
- When mounting the backstop, turn it in freewheeling direction so that the sprags move into the outer ring.
- Secure the inner ring [3] with the circclip [2] in axial direction.
- Mount sleeve [5], shims [7] and bearing cover [6] in reverse order.
- Change the direction arrow on the gear unit housing.
- Refill the gear oil (→ Sec. Lubricants). Check the oil level.
- After mounting, check that the backstop runs smoothly.

5.4 Shaft end pump SHP

Usage

If pressure lubrication is required (→ section "Lubrication"), the maintenance-free shaft end pump SHP with external piping is the preferred solution for gear unit sizes 04...09.

The maintenance-free shaft end pump SHP .. can be used to lubricate gear unit parts of gear unit sizes 04 to 09 that are not submerged in the oil bath. The shaft end pump can be operated in both directions of rotation.



A minimum input speed is required for correct functioning of the shaft end pump. It is therefore absolutely mandatory to contact SEW in case of variable input speeds (e.g. with inverter controlled drives) or when changing the input speed range of an already delivered gear unit with shaft end pump.

Pump position

The pump is mounted externally to the gear unit and is directly driven by the input shaft (HSS) or intermediate shaft of the gear unit. A high reliability of the pump function is ensured in this way. The pump position depends on the

- number of gear unit stages
- gear unit type (helical or bevel-helical)
- shaft position of the gear unit
- LSS type



Check for interference of the shaft end pump with other surrounding structures.

The following tables indicate the position of the pump:



	Shaft positions			
	23	13 ¹⁾	24 ¹⁾	14
MC2P <ul style="list-style-type: none">• Solid shaft• Hollow shaft with keyway• Hollow shaft with shrink disc				
MC3P <ul style="list-style-type: none">• Solid shaft• Hollow shaft with keyway• Hollow shaft with shrink disc				

1) The maximum permitted external loads on the LSS are lower

	Shaft positions			
	03	04	03 ¹⁾	04 ¹⁾
MC2R <ul style="list-style-type: none">• Solid shaft				
MC2R <ul style="list-style-type: none">• Hollow shaft with keyway				
MC2R <ul style="list-style-type: none">• Hollow shaft with shrink disc				
MC3R <ul style="list-style-type: none">• Solid shaft• Hollow shaft with keyway• Hollow shaft with shrink disc				

1) The maximum permitted external loads on the LSS are lower.



Pump suction

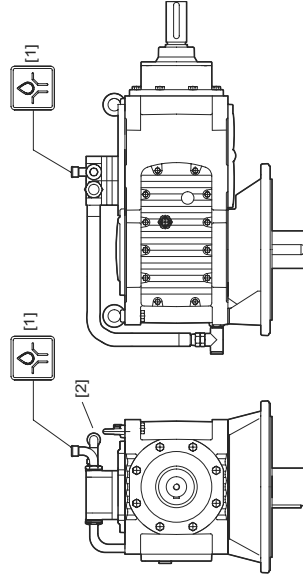


- It is essential that the gear unit is sufficiently lubricated from the very beginning!
- Do not change the diameter of the tube / pipe connection!
- Do not open the pressure line [PRE]!
- If the shaft end pump does not build up pressure within 10 seconds after the gear unit has been started (flow switch or - visual indicator) please contact SEW-EURODRIVE.

Shaft end pump mounted on top of the MC.V.. gear unit



Danger of dry-start with shaft end pump mounted on top of gear unit.



57683AXX

Figure 53: Shaft end pump mounted top of the gear unit

- [1] separate suction oil filling plug
- [2] Flow switch or visual flow indicator (not visible in drawing)

It is essential that the oil pump begins to pump oil at the same time when the main motor begins to rotate. If the pump does not begin to pump oil immediately when gear unit begins to rotate, the separate suction oil filling plug of the pump [1] must be opened and some oil (1-4 liter) must be poured in. When oil begins to circulate (control with flow switch or visual flow indicator [2]) close the separate suction oil filling plug [1].

This procedure is especially important when the gear unit has been standing for a long period and suction pipe and oil pump is full of air.



5.5 Installation with steel frame

For industrial gear units of the MC series in horizontal mounting position (MC2PL.., MC3PL.., MC2RL.., MC3RL..), SEW-EURODRIVE supplies preassembled drive packages on a steel frame (swing base or base frame).

Swing base

A swing base is a steel frame [1] that accommodates gear unit, (hydro) coupling and motor (and brake, if required) such as

- hollow shaft gear unit or
- solid shaft gear unit with flange coupling on the output shaft

The swing base [1] is supported by a torque arm [2] (→ Sec. "Torque arm").

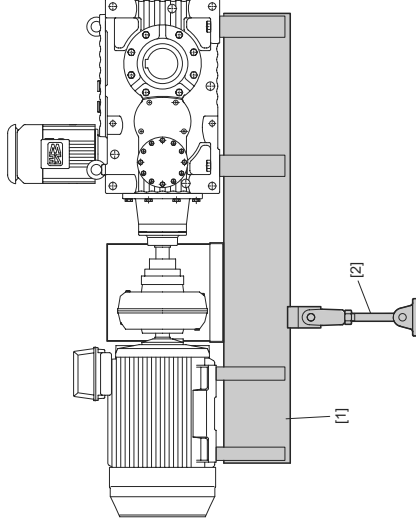


Figure 54: Industrial gear unit of the MC.. series on swing base with torque arm

- [1] Swing base
- [2] Torque arm

51691AXX

It is essential that

- the system is dimensioned in such a way that the torque of the torque arm can be absorbed (→ Sec. "Gear unit foundation")
- that the swing base is not deformed during installation (hazard of damage to gear unit and coupling)



If the gear unit makes sideways movement during running or if there are noticeable frequent torque peaks, the rigid torque arm should not be used, instead a torque arm with a flexible bushing should be used. Please contact SEW.

Base frame

A base frame is a steel frame [1] that accommodates gear unit, (hydro) coupling and motor (and brake, if required). The steel frame is supported by several foot mountings [2]. Such a frame is usually used for solid shaft gear units with elastic coupling on the output shaft.

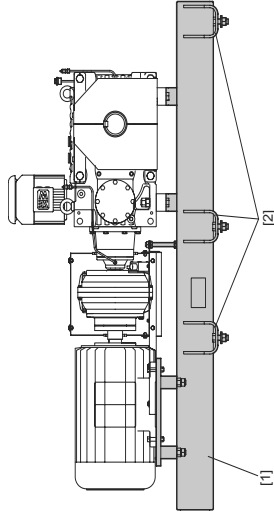


Figure 55: MC.. industrial gear units on base frame with foot mounting

[1] Base frame

[2] Foot mounting

51692AXX

It is essential that

- the support structure of the foot mounting is adequately dimensioned and rigid (→ Sec. "Gear unit foundation")
- that the base frame is not deformed through incorrect alignment (hazard of damage to gear unit and coupling).



5.6 Torque arm

If the gear unit makes sideways movement during running or if there are noticeable frequent torque peaks, the rigid torque arm should not be used, instead a torque arm with a flexible bushing should be used. Please contact SEW-EURODRIVE.



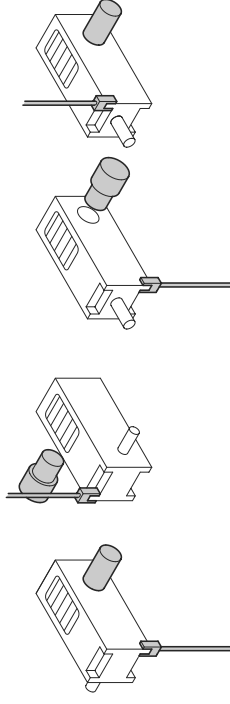
Mounting options

A torque arm is available as option to be mounted directly to the gear unit or to the swing base.



Directly mounted to the gear unit

Always mount the torque arm on the side of the driven machine.



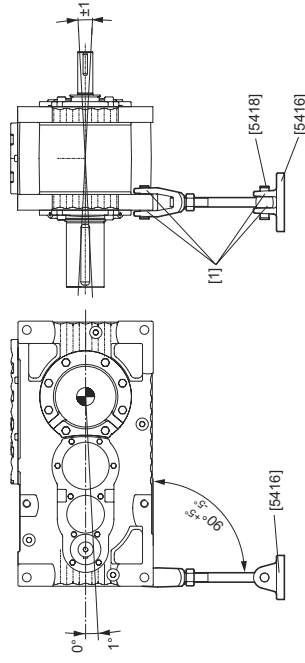
51703AXX

Figure 56: Mounting options for the torque arm

The torque arm can be directly mounted to the gear unit both in the case of tensile strain and compressive stress. Additional strain or stress to the gear unit can be caused by

- eccentricity during operation
- expansion of the driven machine due to heat.

To avoid such strain, the anchor bolt [5418] is equipped with double connection elements that allow sufficient lateral and radial play [1].



51705AXX

Figure 57: Torque arm directly mounted to the gear unit

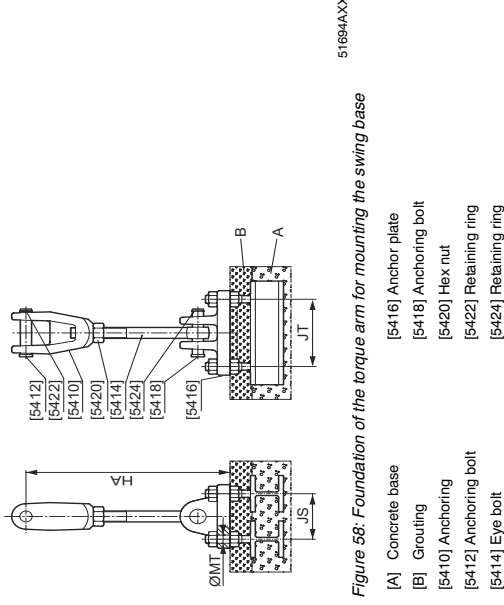
It is essential that there is sufficient play [1] between torque arm and retaining plate [5416] as well as between torque arm and gear unit. This way, no bending force can act on the torque arm and the bearings of the output shaft are not subjected to additional stress.



Foundation for the torque arm

To build the foundation for the torque arm directly mounted to the gear unit or mounted to the swing base of the motor, do the following:

- Place the supporting girders horizontally in their fixed locations. Embody the supporting girders in the base concrete [A].
- Reinforce the concrete base [A] and interlock using steel rods. The base concrete (A) must withstand the same load as the weld joints of the foundation screws.
- After having mounted the torque arm, carry out the grouting and bond it to the base concrete with steel rods.



51694XXX

Figure 58: Foundation of the torque arm for mounting the swing base



All parts except positions A and B are included in the scope of delivery.

The length HA of the torque arm (→ table below) can be selected as required in the range between HA_{min} and HA_{max}. The torque arm is supplied as special version if HA is required longer than HA_{max}.

Gear unit size	HA [mm] min. ... max.	JT [mm]	JS [mm]	Ø MT [mm]
02, 03	360 ... 410	148	100	18
04, 05	405 ... 455			
06, 07	417 ... 467			
08, 09	432 ... 482	188	130	22

5.7 Mounting of V-belt drive

A V-belt drive is used when the overall gear ratio needs to be adjusted. The standard scope of delivery includes motor bracket, belt pulleys, V-belts and belt guard.



Observe the permitted weight for motor and gear unit specified in the following table:

G_M = Motor weight G_G = Gear unit weight

	MC2P/MC3P	MC2P/MC3R
Upright mounting: Foot mounted $G_M \leq 0.4 \times G_G$ Shaft mounted $G_M \leq 0.4 \times G_G$ Flange mounted $G_M \leq 0.4 \times G_G$	Contact SEW-EURODRIVE	Contact SEW-EURODRIVE
Horizontal LSS mounting: Foot mounted $G_M \leq 1.0 \times G_G$ Shaft mounted $G_M \leq 1.0 \times G_G$ Flange mounted $G_M \leq G_G$	54046AXX	54047AXX
Vertical LSS mounting: Foot mounted $G_M \leq 0.4 \times G_G$ Shaft mounted $G_M \leq 0.4 \times G_G$ Flange mounted $G_M \leq 0.4 \times G_G$	54052AXX	Contact SEW-EURODRIVE



Higher motor weights only allowable if stated in the order specific documents.



G_M = Motor weight

G_G = Gear unit weight

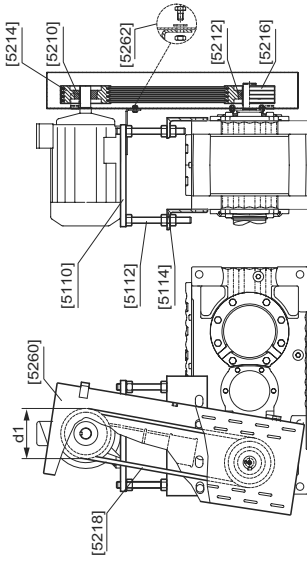


Figure 59: V-belt drive

- [5110, 5112] Motor bracket
- [5114] Angle bracket
- [5210, 5212] Taper bushing
- [5214, 5216] Belt pulleys
- [5218] V-belt
- [5260] Belt guard cover

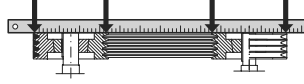
51695AXX

Installation

- Mount the motor on the motor bracket (retaining screws not included in the scope of delivery).
- Attach the back plate of the belt guard cover [5260] to the motor bracket [5112, 5114] of the gear unit using screws. Take into account the desired direction of the opening of the belt guard cover [5260]. To adjust the tension of the V-belt, loosen the upper screw [5262] of the backplate of the belt guard cover.
- **Installing the taper bushings [5210, 5212]:**
 - Mount the belt pulleys [5214, 5216] onto motor and gear shaft as closely as possible to the shaft shoulder.
 - Degrease taper bushings [5210, 5212] and belt pulleys [5214, 5216]. Place the taper bushings into the belt pulleys [5214, 5216]. Make sure that the boreholes are aligned.
 - Grease the retaining screws and screw them into the thread of the belt pulley hub.



- Clean motor and gear shaft and insert the complete belt pulleys [5214, 5216].
- Tighten the screws. Tap slightly against the sleeve and retighten the screws. Repeat this procedure several times.
- Make sure that the belt pulleys [5214, 5216] are aligned accurately. Check correct alignment using a steel ruler making contact at four points (→ following figure).



51697AXX

- Fill the holes with grease to exclude dirt.
- Draw V-belts [5218] over the pulleys [5214, 5216] and tighten the belts using the adjustment screws in the motor bracket (→ Sec. V-belt tightening).
- The maximum permissible error is 1 mm per 1000 mm span of the V-belt. This way, maximum power transmission is ensured and excessive loads on the gear and motor shafts can be prevented.
- **Check belt tension using a V-belt tension meter:**
 - Measure the length of the V-belt span (= free V-belt length)
 - Measure the perpendicular force causing a 16 mm sag per 1000 mm of the belt. Compare the measured values with those listed in Sec. "V-belt tightening".
- Tighten the lock screws for the motor rack and the belt guard rear plate.
- Mount the belt guard cover using the hinge pins. Secure the hinge pins.

V-belt tightening

V-belt profile	$\varnothing d_1$ [mm]	Force required to offset the V-belt by 16 mm per 1000 mm span length [N]
SPZ	56 - 95	13 - 20
	100 - 140	20 - 25
SPA	80 - 132	25 - 35
	140 - 200	35 - 45
SPB	112 - 224	45 - 65
	236 - 315	65 - 85
SPC	224 - 355	85 - 115
	375 - 560	115 - 150

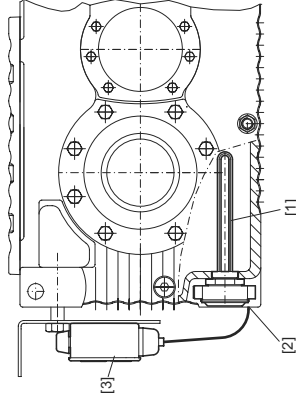
5.8 Oil heater

Purpose and basic design

Oil heating is required to ensure lubrication at startup when the ambient temperature is low (e.g. cold start of the gear unit).

The oil heater consists of 3 basic parts:

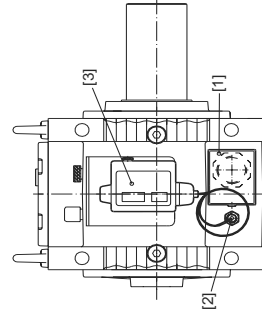
1. Resistor element in the oil bath ("Oil heater") with terminal box
2. Temperature sensor
3. Thermostat



50530AXX

Figure 60: Oil heater for MC.. series industrial gear units

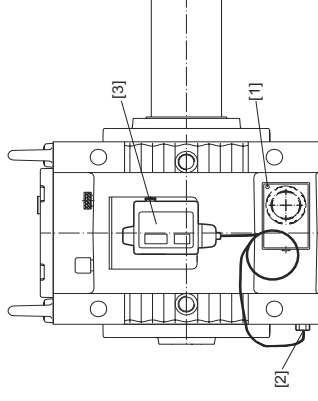
- [1] Oil heater
- [2] Temperature sensor
- [3] Thermostat



50538AXX

Figure 61: Position of the temperature sensor in gear unit sizes 04 - 06

- [1] Oil heater
- [2] Temperature sensor
- [3] Thermostat



50539AXX

Figure 62: Position of the temperature sensor in gear unit sizes 07 - 09

- [1] Oil heater
- [2] Temperature sensor
- [3] Thermostat

Activation / deactivation behavior

- The oil heater is activated when the factory set temperature is reached. This temperature setpoint depends on the following:
 - for splash/bath lubricated units: on the pour point of the used oil
 - for pressure lubricated units: on the temperature at which the oil viscosity is maximal 2000 cSt

	Setpoint for splash/bath lubrication [°C]					
	ISO VG 680	460	320	220	150	100
Mineral oil	-7	-10	-15	-20	-25	-28
Synthetic oil		-30	-35	-40	-40	-45

	Setpoint for pressure lubrication [°C]					
	ISO VG 680	460	320	220	150	100
Mineral oil	+25	+20	+15	+10	+5	
Synthetic oil		+15	+10	+5	0	-5

- Is deactivated when the set temperature is exceeded by 8 to 10° C.

The thermostat and the oil heater are normally installed to the gear unit and are ready to operate but without electrical connections. Therefore, the following has to be done before startup:

1. Connect the resistor element ("Oil heater") with the power supply
2. Connect the thermostat with the power supply



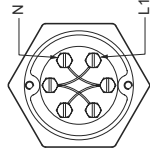
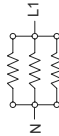
Technical data

Gear unit size	Power consumption oil heater [W]	Voltage supply [V _{AC}]
04 - 06	600	see separate data sheet ¹⁾
07 - 09	1200	

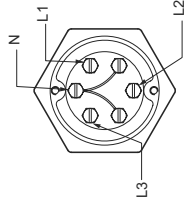
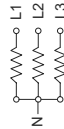
1) use only voltage specified in separate data sheet.

Electrical
connection resis-
tor element

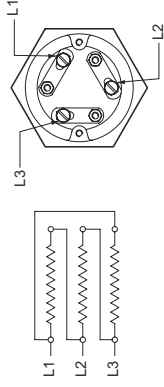
Wiring diagram examples with 230/400 V line voltage



1-phase	
Voltage	230 V
Phase voltage	230 V
Main voltage	400 V
Element voltage	230 V



3-phase / star connection	
Voltage	230/400 V
Phase voltage	230 V
Main voltage	400 V
Element voltage	230 V



3-phase / delta connection	
Voltage	400 V
Main voltage	400 V
Element voltage	400 V

Basic design
thermostat

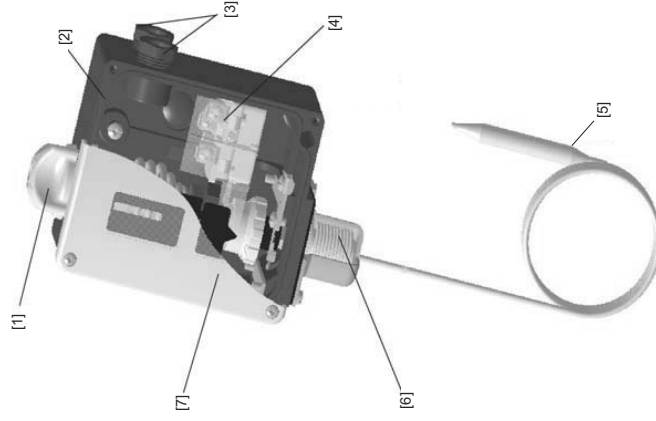


Figure 63: Basic design thermostat (Example)

- [1] Setting range knob
- [2] IP66 enclosure (units with external reset IP54)
- [3] 2 x PG 13.5 cable diameter 6 mm → 14 mm
- [4] SPDT contact system. Exchangeable
- [5] Capillary tube length up to 10 m
- [6] Stainless steel bellows
- [7] Polyamide cover

53993AXX



Basic design thermostat

	RT thermostats
Ambient temperature	-50°C to +70°C
Connection diagram	<p>[1] Line [2] SPDT</p>
Connection data	<p>Alternating current: AC-1: 10 A, 400 V AC-3: 4 A, 400 V AC-15: 3 A, 400 V</p> <p>Direct current: DC-13: 12 W, 230 V</p>
Contact material: AgCdO	
Cable entry	2 PG 13.5 for 6 -14 mm diameter cable
Enclosure	IP66 acc. to IEC 529 and EN 60529. Units with external reset IP54. Thermostat housing is made of bakelite acc. to DIN 53470, the cover is made of polyamid.

In the following cases, a contactor must be used:

- a 3-phase voltage supply is used
- 2 heating rods are used
- current ratings exceed nominal values of the thermostat

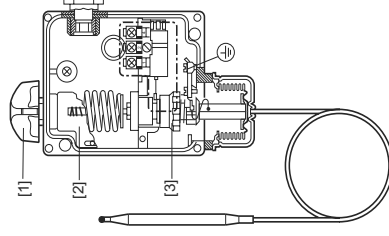


Adjusting the setpoint

The setpoint is normally set at the factory. For adjustments, the following process has to be followed:

The range is set by using the setting knob [1] while at the same time reading the main scale [2]. Tools must be used to set thermostats equipped with a seal cap. The differential is set by the differential disc [3].

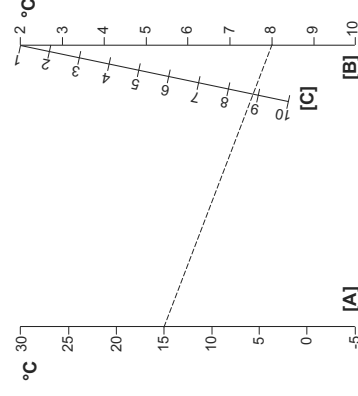
The size of the obtained differential can be established by comparing the set main scale value and the scale value on the differential disc with the help of the nomogram for the thermostat concerned.



53994AXX

Figure 64: design thermostat

- [1] Setting knob
- [2] Main scale
- [3] Differential setting disc



53992AXX

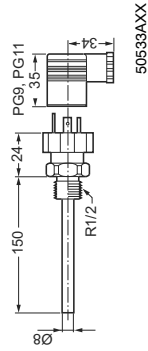
Figure 65: Nomogram for obtained differential

- [A] Range setting
- [B] Obtained differential
- [C] Differential setting

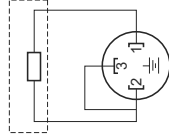
5.9 Temperature sensor PT100

The temperature sensor PT100 can be used to measure the temperature of the oil in the gear unit.

Dimensions



Electrical connection



50534AXX

Technical data

- Sensor tolerance $\pm(0.3 + 0.005 \times t)$, (corresponds to DIN IEC 751 class B), $t = \text{oil temperature}$
- Plug connector DIN 43650 PG9 (IP65)
- The tightening torque for the retaining screw in the back of the plug connector for electrical connection is 25 Nm.

5.10 SPM adapter

SPM adapters are available for measuring the shock pulses of the gear unit bearings. Shock pulses are measured using shock pulse sensors attached to the SPM adapter.

Mounting position

MC.R...: An extended SPM adapter [3] is required if a motor flange or fan is used.

MC.R...: SPM adapters [1] and [2] are attached on the side of the gear unit; SPM adapter [3] is attached on the pinion housing.

MC.P...: SPM adapters [1] and [2] are attached on the side of the gear unit.

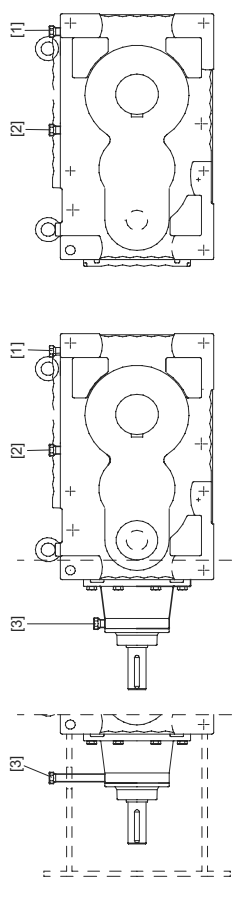


Figure 66: Mounting positions of SPM adapters

51884AXX

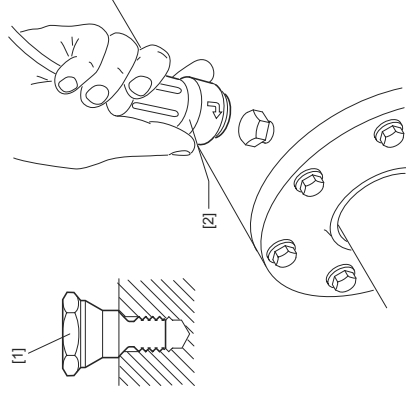


Figure 67: Mounting the shock pulse sensor onto the SPM adapter

51885AXX

Mounting of shock pulse sensor

- Remove the protection cap of the SPM adapter [1]. Ensure that the SPM adapter [1] is tightened correctly and securely.
- Mount the shock pulse sensor [2] onto the SPM adapter [1].



5.11 Fan

A fan can be mounted if the projected thermal power of the gear unit is exceeded. A fan can be retrofitted if the ambient conditions change after having installed the gear unit. The direction of rotation of the gear unit does not influence the operation of the fan.

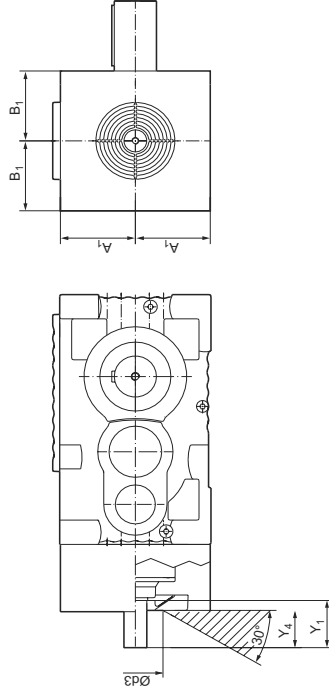


Figure 68: Mounting dimension of the fan



Make sure that air intake vents are not blocked or covered!

Gear unit type	A ₁	B ₁	Y ₄ [mm]	Y ₁	Air Intake ∅ d ₃ [mm]	Angle
MC3RL..02	158	160	70	100	109	30°
MC3RL..03	178	165	82	112	131	
MC3RL..04	198	185	90	120	131	
MC3RL..05	213	195	95	125	156	
MC3RL..06	232	220	100	130	156	
MC3RL..07	262	230	105	135	156	
MC3RL..08	297	255	105	135	198	
MC3RL..09	332	265	110	140	226	



5.12 Flow switch

Usage

The flow switch is an electrical switch used for controlling the correct functioning of a pressure lubrication system (→ Shaft end pump; → Motor pump) by checking the oil flow.

In deliveries since March 1st 2005, the flow switch is a standard feature for all gear units supplied with

- a motor pump
- a shaft end pump with a flow rate of 8.5 l/min or higher.

Shaft end pumps with a flow rate below 8.5 l/min are equipped only with a visual flow control device (→ Visual flow indicator) as standard (available as of 2006).

If flow is more than 8.5 l/min, the gear unit is delivered with visual flow control and flow switch (from beginning of year 2006).

Selection

SEW-EURODRIVE selects the flow switch. As standard, a flow switch of the the type DW-R-20 is used. All the following technical data refer to this type.

Function

The flow pushes against a circular plate attached to a pendulum. The pendulum, which is regulated by a spring, moves on its pivot. A magnet attached to the end of the pendulum operates a movable reed contact. The switch unit itself is separated from the oil.

The flow switch has two switching points:

1. Switching point HIGH (upper limit of flow rate) → contact closed - ON
2. Switching point LOW (lower limit of flow rate) → contact open - OFF



Dimensions

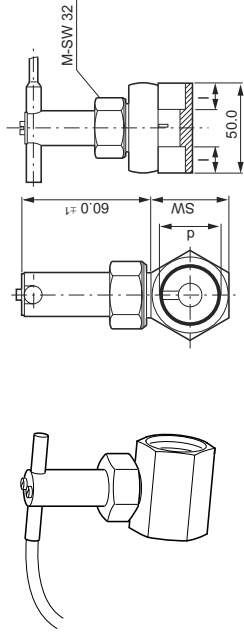


Figure 69: Dimensions

	d	Inner thread	NW (rated width)	I	SW	Z	Z	L	H	Z
						A+B	C	D	D	D
Material						A+B+C				
Dimension	R 3/4"		20	11	30	50	50	19	109	66

Material abbreviations:

- A = Brass
- B = Nickel-plated brass
- C = Stainless steel
- D = Stainless steel / PVC



For determining the exact position of the flow switch, refer to the order-specific dimension drawing

Electrical connection

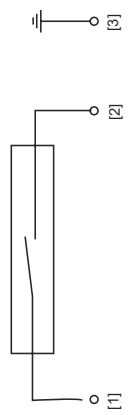


Figure 70: Electrical connection

- [1] Brown
- [2] Blue
- [3] Yellow/green

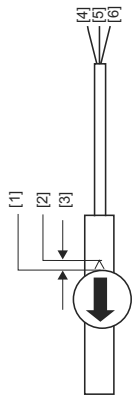


Figure 71: Electrical connection

- [1] High switching point
- [2] Low switching point
- [3] Setting range
- [4] Blue
- [5] Brown
- [6] Yellow/green

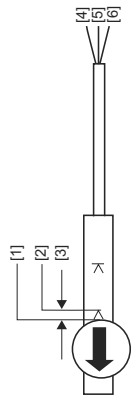


Figure 72: Electrical connection

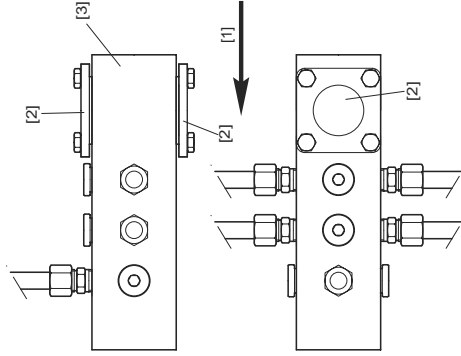
- [1] High switching point
- [2] Low switching point
- [3] Setting range
- [4] Blue
- [5] Brown
- [6] Yellow/green

Connection data: 230 V; 1.5 A; 80 W, 90 V_{Amax}
 Enclosure: IP 65
 Maximum temperature of medium: 110°C
 Maximum ambient temperature: 70°C
 Maximum working pressure: 25 bar
 Length of connecting cable: 1.5 m
 Switch: You can use the switch as normally closed or normally open contact; SPDT switch available on request
 Switch hysteresis: approx. 5 %

Type	Switching point range ON	Switching point range OFF	Maximum flow rate
DWR-20	8.5 - 12.0	6.6 - 11.0	80



5.13 Visual flow indicator



57682AXX

Figure 73: Visual flow indicator

- [1] Oil flow direction
- [2] glass
- [3] Oil distribution block

Usage

The visual flow indicator is a simple method of checking the functioning of a pressure lubrication system by visually checking the oil flow. The visual flow indicator is a standard feature in all gear units with oil pump (as of 2006). Gear units with oil pump and a flow rate above 8.5 l/min are equipped with an electrical flow switch and visual flow indicator (as of 2006).

Function

The oil flow can be seen behind the glass [2]. If no oil is flowing and/or if there are air bubbles in the oil, the function of the pump and suction pipes with connections must be checked.



It is easier to see the oil flow when the two glasses [2] are cleaned and bright light is used on the other side of the oil distribution block.



5.14 Connecting the oil/water cooling system



Follow the instructions in the separate manufacturer's documentation when connecting the oil/water cooling system.

5.15 Connecting the oil/air cooling system



Follow the instructions in the separate manufacturer's documentation when connecting the oil/air cooling system.

5.16 Connecting the motor pump



Follow the instructions in the separate manufacturer's documentation when connecting the motor pump.



Startup

Startup of MC gear units

6

6 Startup

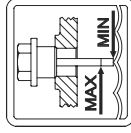
6.1 Startup of MC gear units



- It is essential to adhere to the safety notes in Sec. "Safety Notes."
- It is absolutely necessary to avoid open flames or sparking when working with the gear unit!
- Take preventive measures to protect people from the solvent vapors generated by the vapor phase inhibitor!
- Before startup, check for correct oil level! For lubricant fill quantities, refer to Sec. "Lubricants."
- For gear units with long-term protection: Replace the screw plug on the location indicated by the breather plug (Position → Sec. "Mounting Positions").
- If doing maintenance or/and oil-filling activities on the gear unit check the surface temperature in advance. Danger of burns (hot oil inside gear unit)!)

Before startup

- Remove dust and dirt completely from gear unit surface.
- For gear units with long-term protection: Remove the gear unit from the seaworthy protection box.
- Remove the corrosion protection agent from the gear unit parts. Make sure gaskets, sealing surfaces and sealing lips are not damaged by mechanical abrasion, etc.
- Before filling the gear unit with the correct oil grade and volume, drain the remaining amount of protection oil. To do so, unscrew the oil drain plug and drain the remaining protection oil. Thread the oil drain plug back in place.
- Remove the oil filling plug (Position → Sec. "Mounting Positions"). Use a funnel to fill the oil (filter mesh max. 25 µm). Fill the gear unit with the correct oil grade and volume (→ Sec. "Nameplate"). The oil volume specified on the nameplate of the gear unit is a reference value. **The mark on the dipstick is the decisive indicator of the correct oil level.** Check for correct oil level (= below the "max" mark on the dipstick) using the oil dipstick. After having filled the oil, replace the oil filling plug.
- For gear units with steel oil expansion tank (→ 6.3 Startup of MC gear units with steel expansion tank).



- For gear units with oil sight glass (option): Visually check for correct oil level (= oil is visible in the oil sight glass).

- Make sure that rotating shafts as well as couplings are equipped with suitable protective covers.
- If the gear unit has a motor pump, check for proper functioning of the pressure lubricating system. Make sure that monitoring devices are connected properly.
- After an extended period of storage (max. two years), have the gear unit operate without load with the correct oil fill (→ Sec. "Nameplate"). This way, the correct functioning of the lubricating system and particularly the oil pump is ensured.
- If the gear unit is equipped with a fan on the input shaft, check for free air intake within the specified angle (→ Sec. "Fan").



Startup

Startup of MC gear units with backstop

6

Running-in period

SEW-EURODRIVE recommends running-in the gear unit as first startup phase. Increase load and revolutions in two to three steps up to maximum level. The running-in phase takes about 10 hours.

Check the following points during the running-in phase:

- Verify the power values specified on the nameplate because their frequency may be a decisive factor for the service life of the gear unit.
- Does the gear unit run smoothly?
- Are there vibrations or unusual running noise?
- Are there signs of oil leakages on the gear unit?



For further information and troubleshooting, refer to Sec. "Malfunctions."

6.2 Startup of MC gear units with backstop

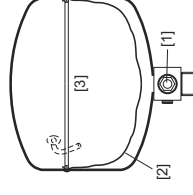


For gear units with backstop, make sure the direction of rotation of the motor is correct!

6.3 Startup of MC gear units with steel oil expansion tank

This chapter describes the procedure for filling oil into gear unit types MC.PV, MC.RV and MC.RE, which are delivered with steel oil expansion tank. Oil filling must be carried out with care to avoid that any air is left in the gear unit. Before filling the gear unit with oil, the membrane in the steel expansion tank must be in down position. During operation of the gear unit, the membrane moves up and down due to the thermal expansion of the oil.

Position of the membrane before startup:



- [1] Oil level
- [2] Membrane in down position
- [3] Air

If air gets under the membrane in the steel oil expansion tank, it can move the membrane upward thus causing pressure in the gear unit and possibly oil leakage.

The oil must have ambient temperature when filling the gear unit and the gear unit must be installed in its final mounting position. If the gear unit is filled before installation, the gear unit must not be tilted during installation to avoid that oil pushes the membrane upward.



Startup Startup of MC gear units with steel oil expansion tank

6

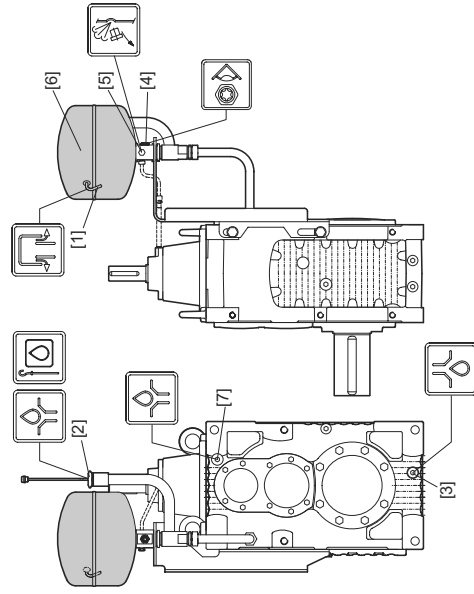


Figure 74: MC.PE./MC.RE., industrial gear units with steel oil expansion tank

- [1] Breather plug
- [2] Oil dipstick and oil filling opening Number 2
- [3] Oil drain plug
- [4] Oil sight glass
- [5] Air outlet screw
- [6] Steel oil expansion tank
- [7] Oil filling opening Number 1

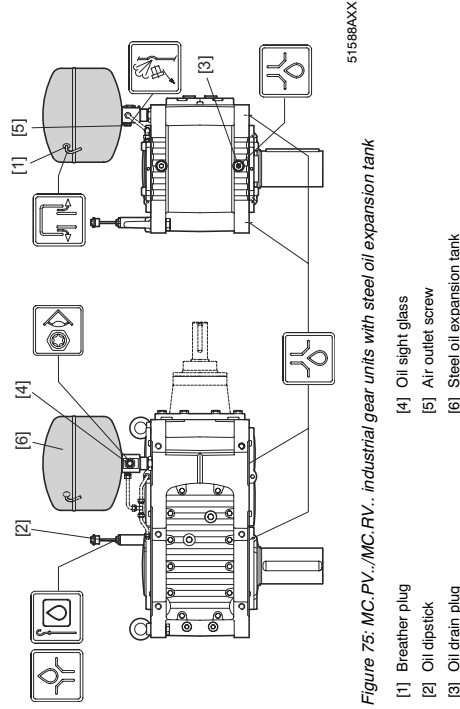


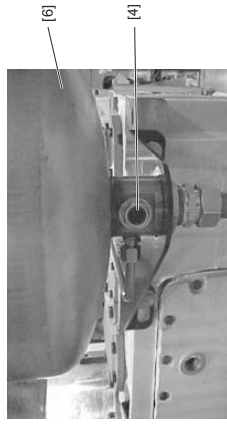
Figure 75: MC.PV./MC.RV., industrial gear units with steel oil expansion tank

- [1] Breather plug
- [2] Oil dipstick
- [3] Oil drain plug
- [4] Oil sight glass
- [5] Air outlet screw
- [6] Steel oil expansion tank



Startup Startup of MC gear units with steel oil expansion tank

6



1. Open the air outlet screw [5].
2. Open ALL upper screw plugs (usually three to four screw plugs) of the gear unit, such as breather plug, oil filling plug and oil dipstick.
3. Blow compressed air into the oil expansion tank through the breather plug [1]. The membrane goes down (sometimes you can hear a "plob").
4. Fill oil through the oil filling openings [2]/[7].
5. When the oil reaches the screw plug openings (except for oil dipstick), re-install the screw plugs on the housing. Start the closing process with that plug where the oil reaches the opening first, then close the second plug and so on. The closing process in this order helps to avoid air spots within the gear unit.
6. Fill the gear unit until oil comes out from the air outlet screw [5]. Close the air outlet screw.
7. Fill oil level to the oil sight glass [4].
8. Check the oil level via oil sight glass and oil dipstick to ensure that the oil level keeps stable. The correct oil level is reached, when the oil sight glass is covered half with oil. The marks on the oil sight glass are decisive for the oil level.
9. Screw in the oil dipstick [2].
10. Carry out a test run to ensure that the oil level does not fall below the oil sight glass.
11. Check the oil level only when the gear unit has cooled off to ambient temperature.

Before filling oil into the gear unit, the membrane in the oil expansion tank must be in down position to prevent pressure from building up in the gear unit. Strict observance of the procedure described is a prerequisite for the fulfillment of any warranty claims.





6.4 Taking MC gear units out of operation



Disconnect the drive from voltage supply and secure it to prevent unintentional restart!

If the gear unit is not operated for a longer period of time, you must activate it at regular intervals every two to three (2 to 3) weeks.

If the gear unit is not operated for a period **longer than six (6) months**, additional corrosion protection is required:

- **Corrosion protection for the inside of gear units with splash lubrication or bath lubrication:**

Fill the gear unit up to the breather plug with the oil grade specified on the nameplate.

- **Corrosion protection for the inside of gear units with oil pressure lubrication:**
Contact SEW-EURODRIVE in this case!

- **Surface corrosion protection:**

Apply a wax-based protective coating onto shaft ends and unpainted surfaces as corrosion protection. Grease the sealing lips of the oil seal to protect them from preservative agents.

For taking the gear unit back into operation, refer to Sec. "Startup".



7 Inspection and Maintenance

7.1 Inspection and maintenance intervals

Interval	What to do?
<ul style="list-style-type: none">• Daily	<ul style="list-style-type: none">• Check the housing temperature:<ul style="list-style-type: none">– with mineral oil: max 90 °C– with synthetic oil: max. 100 °C• Check gear unit noise• Check the gear unit for signs of leakage
<ul style="list-style-type: none">• After 500 - 800 hours of operation	<ul style="list-style-type: none">• First oil change after initial startup
<ul style="list-style-type: none">• After 500 hours of operation	<ul style="list-style-type: none">• Check the oil level, refill oil (→ Nameplate) if necessary
<ul style="list-style-type: none">• Every 3000 hours of operation, at least every 6 months	<ul style="list-style-type: none">• Check the oil: If the gear unit is operated outdoors or in humid conditions, check the water content of the oil. The water content must not exceed 0.05 % (500 ppm).• Fill labyrinth seals with grease. Use about 30 g grease per grease nipple.• Clean the breather plug
<ul style="list-style-type: none">• Every 4000 hours of operation	<ul style="list-style-type: none">• For gear units with drywell: Regrease the lower bearings of the LSS
<ul style="list-style-type: none">• Depending on the operating conditions, at the latest every 12 months	<ul style="list-style-type: none">• Change the mineral oil (→ Sec. "Inspection and maintenance of the gear unit")• Check whether retaining screws are tightly secured• Check contamination and condition of the oil/air cooling system• Check the condition of the oil/water cooling system• Clean oil filter, replace filter element if necessary
<ul style="list-style-type: none">• Every 8000 hours of operation, at the latest every 2 years	
<ul style="list-style-type: none">• Depending on the operating conditions, at the latest every 3 years	<ul style="list-style-type: none">• Change synthetic oil (→ Sec. "Inspection and maintenance of the gear unit")
<ul style="list-style-type: none">• Varying (depending on external factors)	<ul style="list-style-type: none">• Repair or renew the surface/anticorrosion coating• Clean the gearcase surface and fan• Check the oil heater:<ul style="list-style-type: none">• Are all connection cables and terminals tightened securely and free from corrosion?• Clean incrustated elements (such as the heating element) and replace, if required (→ Sec. "Inspection and maintenance of the gear unit")



7.2 Lubricant change intervals

Change the oil more frequently when operating the industrial gear unit under more severe/aggressive environmental conditions!

Mineral CLP lubricants and synthetic polyalphaolefin-based (PAO) lubricants are used for lubrication. The synthetic lubricant CLP HC (according to DIN 51502) shown in the following figure corresponds to the PAO oils.

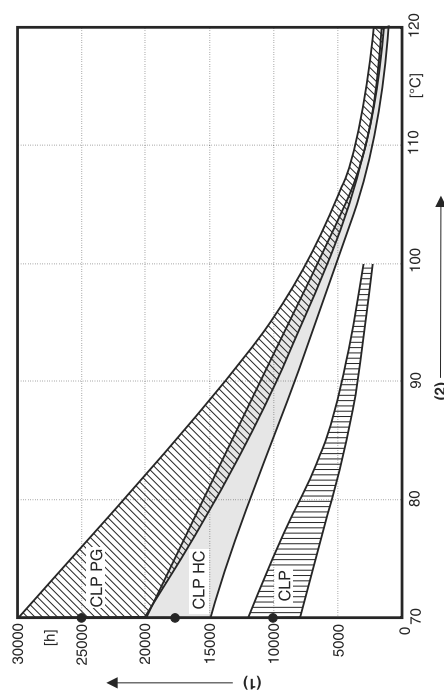


Figure 76: Lubricant change intervals for MC gear units under normal ambient conditions

- (1) Hours of operation
- (2) Sustained oil bath temperature
- Average value per oil type at 70°C



7.3 Inspection and maintenance of the gear unit

- Do not mix different synthetic lubricants and do not mix synthetic with mineral lubricants!
- For positions of the oil level plug, the drain plug, the breather plug and the oil sight glass, refer to Sec. "Mounting Positions."



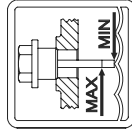
Checking the oil level

1. Disconnect the motor from voltage supply and secure it to prevent unintentional restart!

Wait until the gear unit has cooled off – Danger of burns!



2. For gear units with oil dipstick:
 - Unscrew the oil dipstick and remove it. Clean the dipstick and re-insert it into the gear unit (do not screw in tightly!).
 - Remove dipstick again and check oil level. Correct if necessary: the oil level is correct when it is between the oil level mark (= maximum oil level) and the end of the dipstick (= minimum oil level)
3. For gear units with oil sight glass (option): Visually check correct oil level (= middle of oil sight glass)



Checking the oil

1. Disconnect the motor from voltage supply and secure it to prevent unintentional restart!

Wait until the gear unit has cooled off – Danger of burns!



2. Remove some oil from the oil drain plug
3. Check the oil consistency

- Viscosity
- If you can see that the oil is heavily contaminated, we recommend to change the oil disregarding the service intervals specified in Sec. "Service and maintenance intervals."

Changing the oil

When changing the oil, clean the gearcase thoroughly to remove oil residues and abrasion. Use the same oil grade as for the operation of the gear unit.

1. Disconnect the motor from voltage supply and secure it to prevent unintentional restart!

Wait until the gear unit has cooled off – Danger of burns! If your gear unit is equipped with an oil expansion tank, let the gear unit cool off until it reaches ambient temperature. The reason is that there might still be oil in the oil expansion tank which might leak through the oil filling hole!



Note: The gear unit must still be warm because the high viscosity of cold oil will make it more difficult to drain the oil correctly.

2. Place a container under the oil drain plug.
3. Remove oil filling plug, breather plug and oil drain plugs. When using a steel oil expansion tank, also remove the air outlet screw on the air expansion tank. To drain the oil completely, blow air through the breather into the oil expansion tank. As a result, the rubber membrane lowers and forces the remaining oil out. The lowering membrane compensates the pressure, which facilitates filling the new oil.
4. Drain the oil completely.
5. Reinstall the oil drain plugs.



6. Use a funnel to fill the oil (filter mesh max. 25 µm). Fill new oil of the same type as the old oil via the oil filling plug (if you want to change the oil type, contact our customer service first).

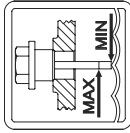
- Fill the oil according to the volume specified on the nameplate (→ Sec. "Nameplate"). The oil volume specified on the nameplate is an approximate value. **The marks on the oil dipstick are decisive for the oil level.**
- Check whether the oil level is correct using the oil dipstick.

7. Reinstall the oil filling plug. If your gear unit is equipped with a steel oil expansion tank, also screw in the air outlet screw.

8. Mount the breather plug.

9. Clean the oil filter, replace the filter element if necessary (when using an external oil/air or oil/water cooling system).

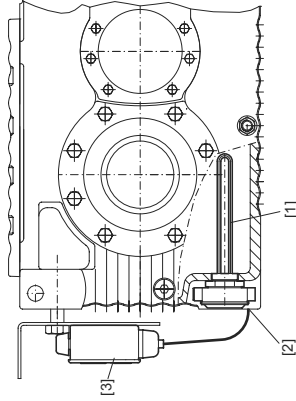
If you remove the housing cover, you must apply new sealing compound to the sealing surface. Else, the tightness of the gear unit is not guaranteed! Contact SEW-EURODRIVE in this case!



Cleaning the oil heater

Removing the oil heater

Incrustation on the oil heater caused by oil must be removed. Remove the oil heater for this purpose.



50530AXX

Figure 77: Oil heater for MC... industrial gear units

- [1] Oil heater
- [2] Temperature sensor
- [3] Thermostat
- Remove the oil heater [1] and the gasket on the gear unit.
- Remove the base of the terminal box.
- Clean the tubular heating elements with solvent.

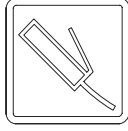
Be careful not to damage the heating elements through scratching or scraping!



Mounting the oil heater

- Reinstall the oil heater [1] and the gasket on the gear unit. The tubular heating elements must always be immersed in liquid.
- Mount the base of the terminal box onto the heating rod using a mounting ring.
- Make sure that the gasket is placed correctly between terminal box and upper end of the heating element.
- Insert the temperature sensor [2] into the oil sump of the gear unit. Set the required temperature on the thermostat [3].

Refilling grease



You can use any lithium-based bearing grease, (some examples see chapter 10.3) to grease the regreasable dust protection covers or labyrinth seals ("Taconite") attached to input and output shafts as option (→ Sec. "Lubricants", "Sealing grease").

For the locations of regreasing points, refer to the order-specific dimension sheet. Use about 30 g grease per grease nipple disregarding the position of regreasing points and gear unit size.

Old grease comes out between shaft and bearing cover lip bringing dirt and sand with it. So the oil seal area can be kept clean. Wipe the bearing cover/shaft clean if there can be seen old grease. Do not use high pressure when filling new grease, press in gently. Do not use more than 30 gramm for one bearing cover.

Vertical gear units with drywell-sealing system on the output shaft

In the drywell version the lower bearings of the low speed shaft are lubricated by grease. Refer to the regreasing label on the gear unit for the amount of lubricating grease is required for the bearings. Use the correct type of grease per regrease nipple as indicated on the regreasing label and in the grease table → chapter 10

Only to be used for greasing the bearings.

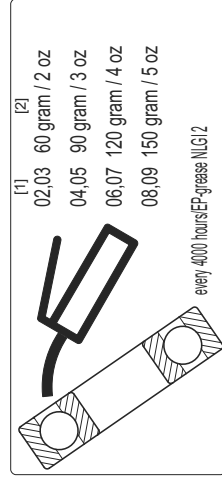
If the gear unit is being stored for a long time, the bearing grease must be replaced before the gear unit is taken into operation.

The bearings must be regreased at regular intervals. Refer to the regreasing label on the gear unit for the required amount of bearing grease and regreasing intervals.

Two types of gear units with drywell are distinguished:

- with extended bearing distance (EBD) type E...G
- with standard bearing arrangement

With extended bearing distance (EBD)/E...G and drywell



57359AEN

Figure 78: Regreasing amount with EBD and drywell (see nameplate MC.V../E..G)

[1] gear unit size (see nameplate)

[2] regreasing amount

Gear unit size MC.V../E...G	Amount of grease [g]	Regreasing interval
02	60	every 4000 running hours or at least every 10 months
03	60	
04	90	
05	90	
06	120	
07	120	
08	150	
09	150	

With standard bearing arrangement and drywell

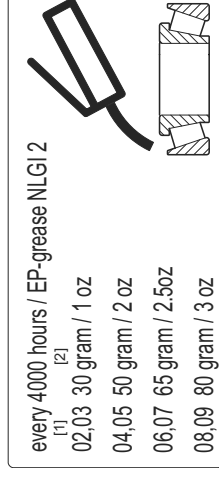


Figure 79: Regreasing amount standard bearing arrangement

[1] gear unit size (see nameplate)

[2] regreasing amount

Gear unit size MC.V../	Amount of grease [g]	regreasing interval
02	30	every 4000 running hours or at least every 10 month
03	30	
04	50	
05	50	
06	65	
07	65	
08	80	
09	80	

57881AEN



Proceed as follows to regrease the bearings:

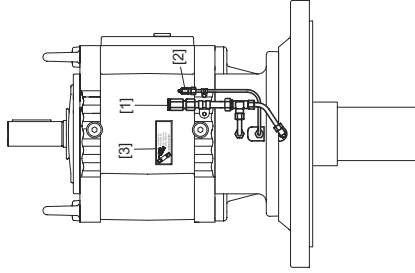


Figure 80: Regreasing drywell gear units (EBD version shown)
57378AXX

- [1] Grease drain pipe
- [2] Grease nipple
- [3] Label with regreasing amount



- Fill in the grease while the gear unit is in operation
- See the label [3] for the amount of grease

Do not fill in the grease with high pressure!

High pressure causes the grease to come out between shaft seal lip and shaft. As a result, the lip seal might be damaged or move out of place, grease might enter the customer's process and the bearing housing might become corroded inside.

Fill in the grease while the gear unit is running by gently pressing the required amount of grease in.

Do not fill more than mentioned on label!

1. Open the pipe [1]. Old grease will leak out.
2. Fill the grease via the grease nipple [2].
3. Close the drain pipe [1].



8 Malfunctions

8.1 Gear unit malfunctions

Problem	Possible cause	Solution
Unusual, regular running noise	A Meshing/grinding noise: bearing damage B Knocking noise: irregularity in the gearing	A Check the oil (see →Sec. "Inspection and Maintenance"), replace bearings B Contact customer service
Unusual, irregular running noise	Foreign particles in the oil	• Check the oil (see Sec. "Inspection and Maintenance") • Stop the drive, contact customer service
Unusual noise in the area of the gear unit mounting	Gear unit mounting has loosened	• Tighten the retaining screws and nuts to the specified torque • Replace the damaged / defective retaining screws or nuts
Operating temperature too high	A Too much oil B Oil too old C Oil contaminated D Gear units with fan: air intake opening / gearbox contaminated E Shaft end pump defective F Malfunctions of oil/air or oil/water cooling system	A Check the oil level, correct if necessary (see Sec. "Inspection and Maintenance") B Check when the oil was changed last time; change oil if necessary (see Sec. "Inspection and Maintenance") C Change the oil (see Sec. "Inspection and Maintenance") D Check the air intake opening and clean if necessary, clean gear unit housing E Check the shaft end pump; replace if necessary F Observe the separate operating instructions of the oil/water and oil/air cooling system!
Bearing point temperatures too high	A Oil not enough B Oil too old C Shaft end pump defective D Bearing damaged	A Check the oil level, correct if necessary (see Sec. "Inspection and Maintenance") B Check when the oil was changed last time; change oil if necessary (see Sec. "Inspection and Maintenance") C Check the shaft end pump; replace if necessary D Check bearing and replace if necessary, contact customer service
Oil leaking: ¹⁾ • from cover plate • from gearbox cover • from bearing cover • from mounting flange • from output/input end oil seal	A Gasket on cover plate (MC2P) / gearbox cover / bearing cover / mounting flange leaking B Sealing lip of oil seal upside down C Oil seal damaged / worn	A Tighten the bolts on the respective cover plate and observe the gear unit. Oil still leaking: contact customer service B Vent the gear unit (see →Sec. "Mounting Positions") Observe the gear unit. Oil still leaking: contact customer service C Contact customer service
Oil leaking • from oil drain plug • from breather plug	A Too much oil B Drive operated in incorrect mounting position C Frequent cold starts (oil foams) and/or high oil level	A Correct the oil level (see Sec. "Inspection and Maintenance") B Mount the breather plug correctly (see Sec. "Mounting Positions") and correct the oil level (see Sec. "Lubricants") C Observe separate operating instructions of the oil/water and oil/air cooling system!
Malfunctions of the oil/air or oil/water cooling system		Observe separate operating instructions of the oil/water and oil/air cooling system!
Operating temperature at backstop too high	Damaged / defective backstop	• Check the backstop; replace if necessary • Contact customer service

¹⁾ It is normal for small amounts of oil/grease to emerge from the oil seal during the running-in phase (24 hour running time, see also DIN 3761).

Customer service

Please have the following information available when contacting our customer service:

- Complete nameplate data
- Nature and extent of the fault
- Time of occurrence and accompanying circumstances of the fault
- Presumed cause

9 Mounting Positions

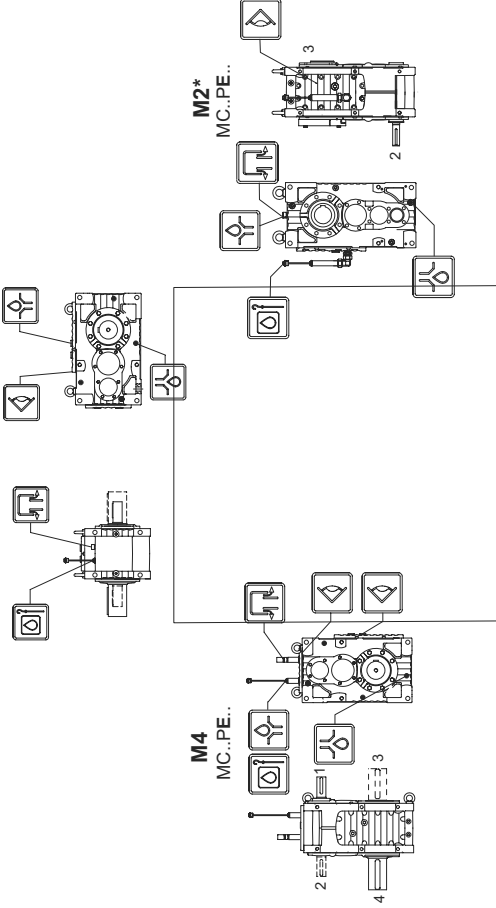
9.1 Symbols used

The following table shows which symbols are used in the subsequent figures and what they mean.

Symbol	Meaning
	Breather plug
	Air outlet screw
	Inspection opening
	Oil filling plug
	Oil drain plug
	Oil dipstick
	Oil sight glass

9.2 Mounting positions of MC.P.. gear units

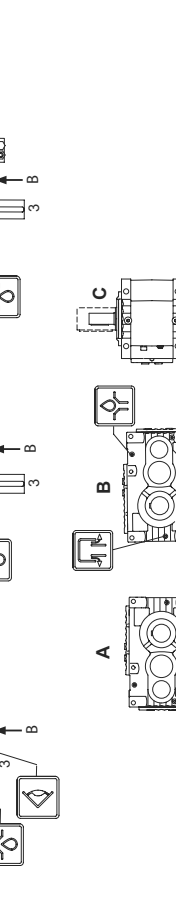
M1+
MC..PL..



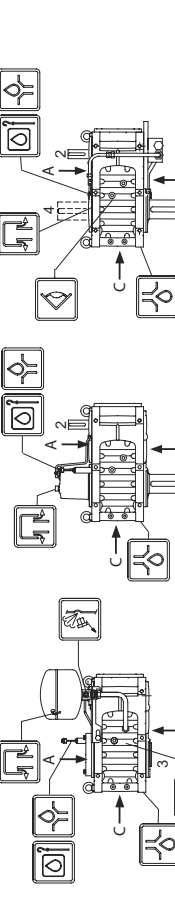
M4
MC..PE..



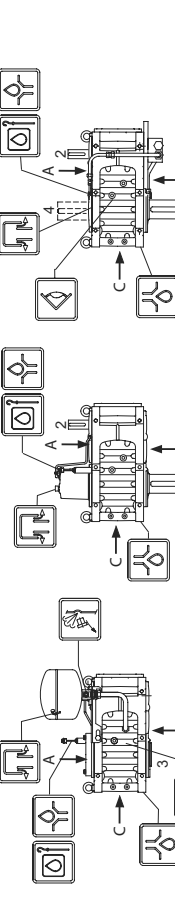
M2*
MC..PE..



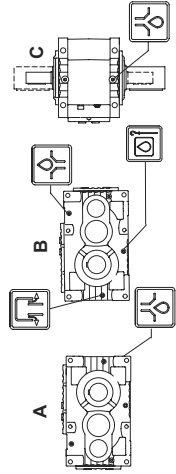
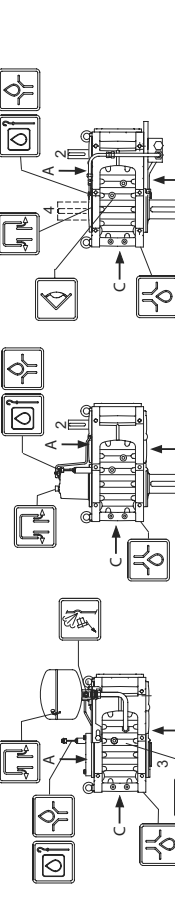
M5
MC..PVS..



MC..PVH..



MC..PV.../SEP

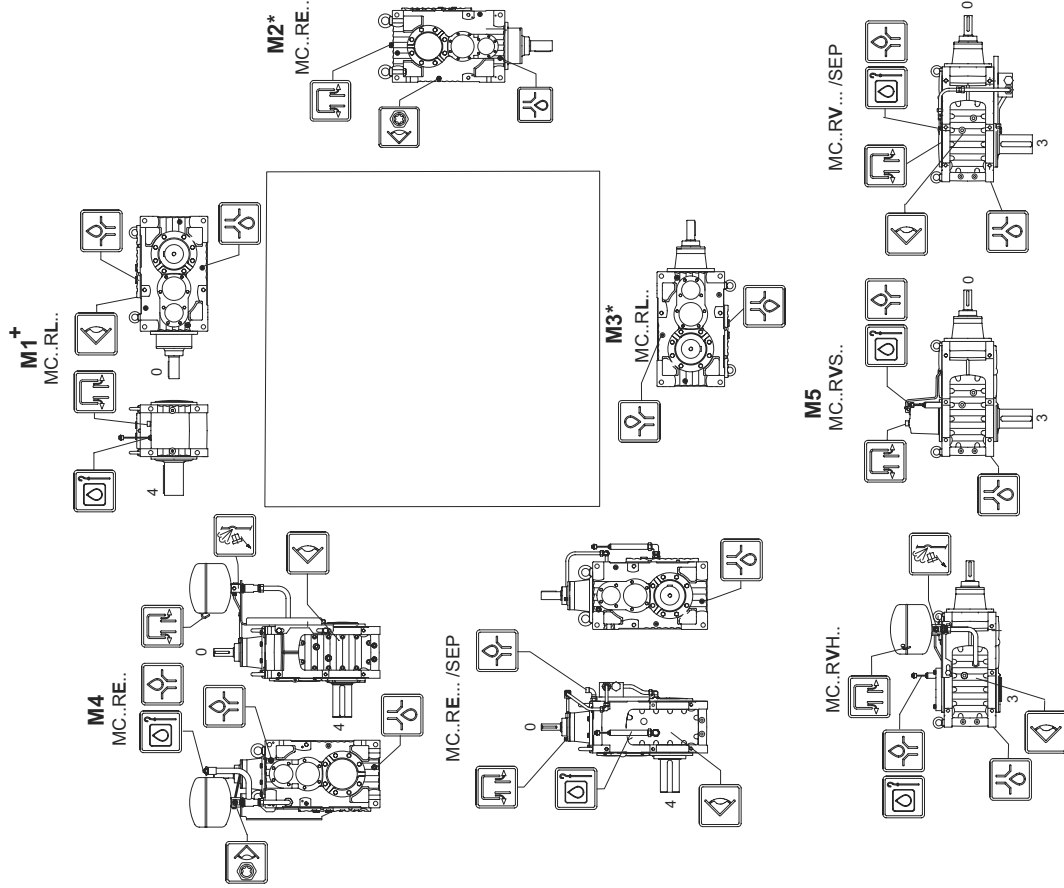


554.77AXX

* = Non-standard mounting position / housing orientation. The positions of heater, dipstick, oil drain plug are only exemplary. Refer to the order-specific dimension drawing.

+ = In horizontal mounting position, the oil drain plug is always located on the opposite side of the output shaft.

9.3 Mounting positions of MC.R.. gear units



* = Non-standard mounting position / housing orientation. The positions of heater, dipstick, oil drain plug are only exemplary. Refer to order-specific dimension drawing.

+ = In horizontal mounting position, the oil drain plug is always located on the opposite side of the output shaft.

10 Design and Operating Notes

10.1 Guideline for oil selection

General

Unless a special arrangement is made, SEW-EURODRIVE supplies the drives without oil fill.

It is therefore necessary to fill the gear unit with the correct type and quantity of oil before taking it into operation. The required information is indicated on the gear unit nameplate.

The required type and quantity of the gear unit oil depends on the following:

- gear unit size and type
- gear unit design (MC..L..., MC..V..., MC...E) and housing orientation (M1...M6)
- oil operating temperature, which depends on
 - transmitted power
 - ambient temperature
 - lubrication type (splash, bath or pressure lubrication)
 - additional cooling methods
- minimum temperature at cold start

In addition to the required viscosity, the oil must meet the following criteria:

- High viscosity index
- Must contain anti-wear, anti-rust, anti-oxidant and anti-foam additives
- Must also contain pressure-resistant additives (EP additives)

If synthetic oils are selected due to operating temperatures or oil change intervals, SEW-EURODRIVE recommends polyalphaolefin-based (PAO) oil.

Mineral oils

Standards

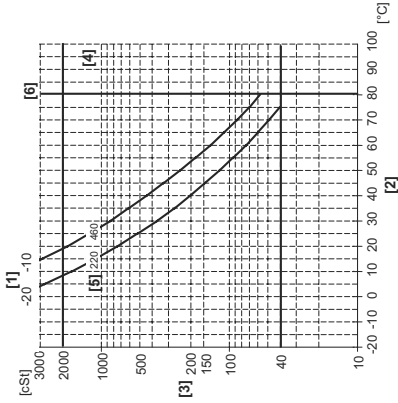
Lubricating oils are grouped in ISO VG viscosity classes according to the ISO 3448 and DIN 51519 standards.

ISO class	ISO 6743-6 designation	DIN 51517-3 designation	AGMA 9005-D94 designation
220	ISO-L-CKC 220	DIN 51517-CLP 220	AGMA 5 EP
460	ISO-L-CKC 460	DIN 51517-CLP 460	AGMA 7 EP

Selecting viscosity
of mineral oils

Lubrication method	Ambient temperature	Mineral ISO VG
<ul style="list-style-type: none">Bath lubricationSplash lubricationPressure lubrication with oil heater and cooler	-15...+20°C	220
<ul style="list-style-type: none">Bath lubricationSplash lubricationPressure lubrication with oil heater and cooler	-5...+40°C	460
<ul style="list-style-type: none">Pressure lubrication with cooler	+10...+20°C	220
<ul style="list-style-type: none">Pressure lubrication without cooler	+20...+40°C	460

Pressure lubrication with or without cooler requires that the situation at cold start is checked! When using an oil pump (pressure lubrication), the starting viscosity must be below 2000 cSt (→ figure 55052AXX).
Use an oil heater (→ chapter 5.8) if necessary.



- [1] Pour point [°C]
- [2] Gear unit's operating temperature of oil [°C]
- [3] Viscosity [cSt]
- [4] Viscosity index VI = 90...100
- [5] ISO VG
- [6] Temperature limitation 80°C



Max. running temperature of gear unit must be noticed. Max allowed running temperature, is 70 deg (long running temp) for ISO VG 220 and 80 deg for ISO VG 460. 90 deg can be used for short periods.
When needed, a cooling device must be used (fan, water/air cooling) or oil changing interval must be shortened (see chapter "Lubrication change interval" in the operating instructions).

Selecting oil type
of mineral oils

Select the oil type according to the required viscosity from the table in chapter "10.2 Lubricants."

Synthetic oils
Standard

Lubricating oils are grouped in ISO VG viscosity classes according to the ISO 3448 and DIN 51519 standards.

ISO-L-CKT 460	ISO 6743-6 designation
220	ISO-L-CKT 220
320	ISO-L-CKT 320
460	ISO-L-CKT 460

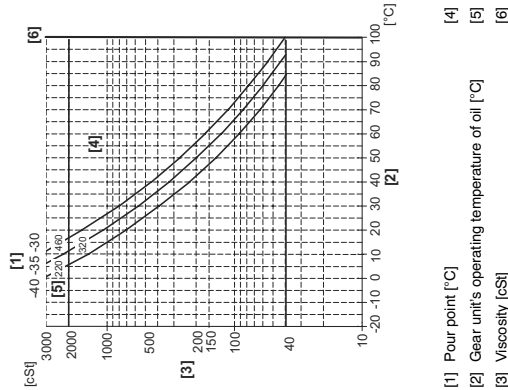
Minimum requirements are the same as for mineral oils

Selecting viscosity
of synthetic oils

Lubrication method	Ambient temperature	Synthetic ISO VG
<ul style="list-style-type: none">Bath lubricationSplash lubricationPressure lubrication with oil heater and cooler	-35...+30°C	220
<ul style="list-style-type: none">Bath lubricationSplash lubricationPressure lubrication with oil heater and cooler	-30...+40°C	320
<ul style="list-style-type: none">Bath lubricationSplash lubricationPressure lubrication with oil heater and without cooler	-25...+50°C	460
<ul style="list-style-type: none">Pressure lubrication with cooler	+5...+30°C	220
<ul style="list-style-type: none">Pressure lubrication with cooler	+10...+40°C	320
<ul style="list-style-type: none">Pressure lubrication without cooler	+15...+50°C	460



Pressure lubrication with or without cooler requires that the situation at cold start is checked! When using an oil pump (pressure lubrication), the starting viscosity must be below 2000 cSt (→ 55051AXX).
Use an oil heater (→ chapter 5.8) if necessary.



- [1] Pour point [°C]
- [2] Gear unit's operating temperature of oil [°C]
- [3] Viscosity [cSt]
- [4] Viscosity index VI = 140...180
- [5] ISO VG
- [6] Temperature limitation 100°C



Max. running temperature of gear unit must be noticed.

Viscosity class ISO VG	Max. allowed running temperatures [°C]
220	80
320	90
460	100 (105 for short periods)



When needed, a cooling device must be used (fan, water/air cooling) or oil changing interval must be shortened (see chapter "Lubrication change interval" in the operating instructions).

Selecting oil type
of synthetic oils

Select the oil type according to the required viscosity from the table in chapter "10.2 Lubricants".

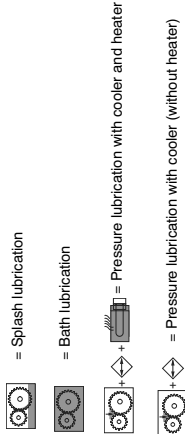


10.2 Lubricants for MC.. industrial gear units

The lubricant table on the following page shows the permitted lubricants for SEW-EURODRIVE gear units. Please note the following key to the lubricant table.

Key to the lubricant table

- CLP = Mineral oil
- CLP PAO = Synthetic polyalphaolefin
- [] = Synthetic lubricant (= synthetic anti-friction bearing grease)
- [] = Mineral lubricant (= mineral-based anti-friction bearing grease)
- 1) = Ambient temperature
- [] = please contact SEW-EURODRIVE
- [] = Lubrication and cooling





Lubricant table

										MC..P		MC..R																																																																																																																																																																																																																																
																																																																																																																																																																																																																																												<



10.4 Lubricant fill quantities

The specified fill quantities are guide values. The precise values vary depending on the gear ratio.

MC.P.

Gear unit size	Lubrication type	Oil volume [l]									
		Two stages					Three stages				
		Mounting position					Mounting position				
		L	V	E	L	V	L	V	E	L	V
02	Splash Bath	9	-	-	11	-	-	25	-	-	-
03	Splash Bath	14	-	-	15	-	-	31	-	-	-
04	Splash Bath	18	-	-	20	-	-	45	-	-	-
05	Splash Bath	24	-	-	27	-	-	58	-	-	-
06	Splash Bath	28	-	-	36	-	-	73	-	-	-
07	Splash Bath	33	-	-	47	-	-	102	-	-	-
08	Splash Bath	55	-	-	68	-	-	133	-	-	-
09	Splash Bath	79	-	-	90	-	-	151	-	-	-

MC.R.

Gear unit size	Lubrication type	Oil volume [l]									
		Two stages					Three stages				
		Mounting position					Mounting position				
		L	V	E	L	V	L	V	E	L	V
02	Splash Bath	10	-	-	10	-	-	19	-	-	-
03	Splash Bath	14	-	-	13	-	-	27	-	-	-
04	Splash Bath	19	-	-	18	-	-	34	-	-	-
05	Splash Bath	22	-	-	24	-	-	47	-	-	-
06	Splash Bath	26	-	-	28	-	-	59	-	-	-
07	Splash Bath	32	-	-	33	-	-	88	-	-	-
08	Splash Bath	58	-	-	56	-	-	111	-	-	-
09	Splash Bath	84	-	-	79	-	-	137	-	-	-



When using pressure lubrication, it is essential to observe the specifications on the nameplate and in the order-specific documentation!



11 Change Index

11.1 Changes to the previous edition

The following section lists the changes made to the individual sections from edition 07/2003, publication number 10560009.

Safety notes

- The subsection "Corrosion and surface correction" has been revised.

Unit design

- The nameplates for "Industrial gear units MC.., SEW-EURODRIVE" have been revised in the subsection "Unit designations, nameplates."
- The subsections
 - "Mounting positions"
 - "Mounting surface"
 - "Housing orientation"
 - "Shaft positions"
 have been added.

Mechanical Installation

- In the subsection "Gear unit foundation", the "Tightening torques" table has been revised.
- In the subsection "Gear unit foundation", the "Connecting flange" and "EBD connecting flange" have been added.
- The subsection "Mounting/removing hollow shaft gear units with shrink disc" has been completely revised.
- In the subsection "Mounting couplings", the "Flexible jaw couplings type MT, MS-MTN" has been included.
- The subsection "Shaft end pump SHP" has been included.
- The subsection "Mounting of V-belt drive" has been changed.
- The subsection "Oil heater" was been revised.
- The subsection "Flow switch" has been included.
- The subsection "Visual flow indicator" has been included.

Mechanical Installation options

**Startup**

- The subsection "Startup of MC gear units with steel oil expansion tank" has been included.

Inspection and maintenance

- In the subsection "Inspection / maintenance of the gear unit", the "Vertical gear unit with Drywell sealing system on the LSS" has been included.

Mounting positions

- The section "Mounting positions" has been completely revised.

Design and operating notes

- The section "Design and operating notes" has been completely revised.

**12 Index**

B		
Backstop FXM	78	
Changing the direction of rotation	78	
C		
Changing the oil	112	
Checking the oil	112	
Checking the oil level	112	
Concrete base	43	
Corrosion protection	13	
D		
Design notes	122	
Direction of rotation	31	
E		
Entsorgung	5	
F		
Fan	99	
Flexible gear couplings	70	
Flow switch	100	
G		
Gear Unit Design	17	
Gear unit foundation	40	
Gear unit malfunctions	118	
Grease	128	
Grouting	44	
Guideline for oil selection	122	
H		
Housing orientation	27	
I		
Important Information	5	
Inspection and maintenance of the gear unit	112	
changing the oil	112	
checking the oil	112	
checking the oil level	112	
cleaning the oil heater	113	
refilling grease	114	
Inspection intervals	110	
Installation notes	60	
Installation tolerances	39	
L		
Lubricant change intervals	111	
Lubricant table	127	
Lubricants	126	
Overview of lubricant fill quantities	129	
Lubrication of industrial gear units	35	
M		
Maintenance intervals	110	
Malfunctions		
possible cause	118	
Solution	118	
N		
Nameplate	19, 21	
O		
Oil bath lubrication	35	
Oil expansion tank made from steel	35	
Oil heater	91	
Oil/air cooling system	104	
Oil/water cooling system	104	
Ölaugeisbehälter aus Grauguss	37	
Operating notes	6	
P		
Pressure lubrication	38	
R		
Rotex coupling	63	
S		
Safety Notes	7	
Shaft end pump SHP	81	
Shaft positions	29	
Splash lubrication	35	
SPM adapter	98	
Mounting of shock pulse sensor	98	
Mounting positions	98	
Startup	105	
Gear units with backstop	106	
Running-in period	106	
Steel frame	84	
Surface protection	13	
Swing base	84	
Synthetic oil	124	
T		
Taking MC.. gear units out of operation	109	
Temperature sensor PT100	97	



Torque arm	85
<i>Foundation</i>	87
<i>Mounting options</i>	85
Transport	9
Transport on a swing base	12
Transport on base plate	11
U	
Unit designation	19
V	
V-belt drive	88
V-belt tightening	90
Visual flow indicator	103

4.17 SLEWING GEARS

Function / Location	ECL Code	Reference
(x1) Turret rotation	1-10-043-65	SLEWING GEAR 06-0980-09-ZZ10 B

(*) : the slewing gear is greased with high temperature grease (see Preventive maintenance chapter)



We congratulate you on having chosen a **ROLLIX slewing ring** and we are sure that you will be totally satisfied by this product when employed following the conditions of use recommended by **ROLLIX DEFONTAINE**

WARNING

The guarantee given by ROLLIX is only valid as long as the instructions for assembly, use and maintenance of slewing rings, as laid down in the ROLLIX technical literature and catalogue, are followed.

In particular nominal, or exceptional loads should not exceed the capacity of the bearing, gear and attachment. Only bolts recommended by ROLLIX must be used for fixing holes.

STRUCTURES

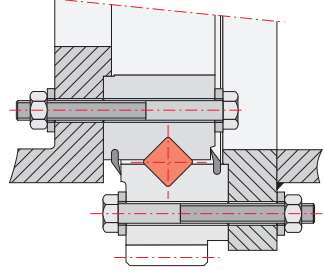
SUPPORTS STRUCTURES

CHASSIS DESIGN

The slewing ring has a moderate axial stiffness : the diameter is large compared to the cross section. It must be mounted on a machined supporting base, ensuring sufficient stiffness with regard to the loads to be transmitted. This makes it possible to ensure an even distribution of stresses and to avoid any deformation during operation, which would be harmful to the good working of the ring.

Therefore, it is necessary to use supporting bases with a minimum thickness not less than the values indicated in the table above.

Raceway mean diameter (mm)	500	750	1000	1250	1500	2000	2500	3000
Minimum thickness(mm)	25	30	35	40	50	60	70	80



FITTING

The use of a slewing ring in any specific application calls for certain precautions or operations to be carried out prior to ensure that the ring is operating under the best conditions and gives the service life expected.

The following will assist in enabling the fitting operation to be carried out correctly.

INFORMATION

This manual and instruction booklet is available in several foreign languages, that you can obtain from us upon simple request. We draw your attention so that you include our maintenance and proposal in those of your machine or failing that, to transmit it to the user.

STRUCTURES

SHAPE TOLERANCES

Shape defects of the supports lead to deformations of the raceway. This can cause tight spots or possible seizure and will reduce the bearing service life.

The maximum flatness defects must not exceed the values of the below table.

Raceway mean diameter (mm)	500	750	1000	1250	1500	2000	2500	3000
Maximum tolerance Crossed roller (mm)	0,10	0,12	0,15	0,18	0,20	0,25	0,29	0,32
Maximum tolerance Ball (mm)	0,12	0,18	0,21	0,25	0,28	0,33	0,38	0,42

SUPPORTING STRUCTURES

These maximum values are allowed for "long waves" in the circumferential direction. "Short waves" for example between two fastening holes, must not exceed 1/4 of the values in the below table.

Waves in the radial direction (conicity) must be less than 0,05 mm / m of raceway mean Ø.

LONG WAVES



SHORT WAVES



STIFFNESS TOLERANCES

The stiffness of the supporting frames must be such that deflections do not exceed the values of the

below table under maximum load.

Raceway mean diameter (mm)	500	750	1000	1250	1500	2000	2500	3000
Maximum deflexion (mm)	0,25	0,30	0,35	0,45	0,55	0,65	0,80	1,00

PLASTICS CEMENTS

If the above tolerances could not be met, then Epoxy type resins can be used instead of finish-machining of the surfaces.

Several products are possible depending on the

dimensions and the amount of out of flatness to be compensated. Detailed instructions are available from our Commercial department.

INSTALLATION

TRANSPORT - HANDLING

Our slewing rings are carefully packed in order to avoid any damage during transport.

Transport and storage are to be carried out in horizontal position only ; transport in other positions requires special methods.

As with any mechanical precision part, the rings must be handled with care avoiding any shocks, particularly along the radial axis.

Handling should be carried out with suitable equipment for the weight of the part, which is indicated on the identification tag.

DELIVERY - STORAGE

The packed rings have an anticorrosive surface protection allowing a 6-month-storage in a covered and temperate room.

A suitable protection must be applied for longer storage.

It is necessary to regrease after each 18-month-period (see paragraph **MAINTENANCE - LUBRICATION**).

UNPACKING - PREPARATION

WHEN UNWRAPPING THE BEARING

- Take care not to cut the protective seals when removing the packing paper.

- Cut this paper, preferably on the external diameter, and not on the upper or lower faces.

When degreasing the bearing :

- Use a standard commercially available solvent.

Chlorine containing solvents are prohibited.

- Take care not to introduce any solvent under the seals or in the raceways.

- Before fitting the grease nipples or junction pipes, remove the plastic caps or the Hc screws from the greasing holes.

WHEN INSTALLING THE BEARING :

STRUCTURE

- Make sure that supporting structures comply with specifications (see chapter **STRUCTURES**).

- Check for chips, weld seam particles, corrosion signs, etc.

- Check the good mating of the rings on the supports.

SPIGOTS

When loads along the radial axis are important, especially when the bearing is placed vertically, it is then mandatory to use the centerings provided for that purpose.

The intercalative structural adhesive type LOCTITE 586 provides a good means to limit the relative displacements between rings and supports.

See our technical instructions IT ETR 521, available upon request.

POSITIONNING

The hardening junction which is marked by a red line on the geared ring, and located at the filler plug on the other ring, must be placed **at 90° to the main load axis** or to the arm supporting the load (see chapter **MARKING**).

INSTALLATION

FASTENING

- Check that the fasteners are really of the recommended grade, e.g. marked 10.9 on the head and that threads are properly lubricated.

- For bearings in normalized steel Z or N, the use of treated hardened flat washers is required as follows :

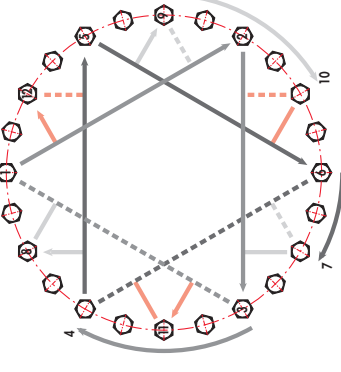
- the yield strength is greater than or equal to 600 MPa,
- the diameter $D_R = 2 d$,
- the thickness $h \geq 0,3 d$.

The **elastic washers** type Belleville, Grower or others of whatever type or pattern are **absolutely prohibited** and will void all warranty.

- Install all fasteners and tighten lightly.

- Then tighten to the specified value using a properly calibrated torque wrench ; hydraulic devices are advisable.

STAR-SHAPED TIGHTENING



TIGHTENING TORQUE

Diameter (mm)	10	12	14	16	18	20	22	24	27	30	33
Torque (N.m)	69	117	185	280	390	560	750	960	1400	1900	2600

WHEN INSTALLING THE PINION :

GEAR

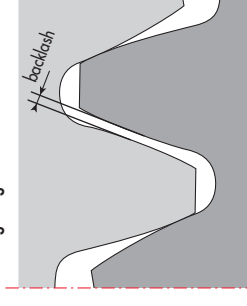
- Adjust the driving pinion to the maximum eccentric point of the ring gear, marked by a blue line.

- At this stage, the backlash must be within the limits of the calculated values or minimum at $0,05 \times$ module.

- When several pinions are used, each one must be adjusted to the same conditions.

- During tests, make sure that good alignment of the pinion and of the slewing ring axes permits a satisfactory contact across all the gear width.

Checking the gear backlash



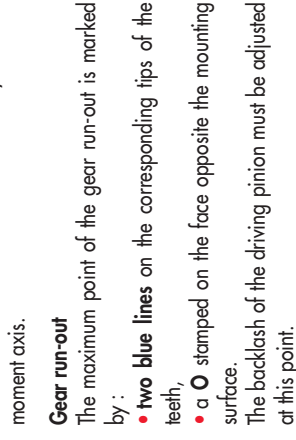
- Before running, lubricate the teeth of the slewing ring gear and of the pinion (see chapter **MAINTENANCE**).

MAINTENANCE

MAINTENANCE - LUBRICATION

A suitable lubrication is essential for the longevity of the raceways and gears. The operating conditions such as loads, temperatures, speeds, vibrations, etc. determine the choice of lubricant.

- manufacturing date,
- part number of the ring,
- its serial number,
- its weight in kilograms.



Mean raceway ball/roller pitch Ø	1116					
Variation N in the family	00					
Material code letter ungeared ring	Z					
Material code letter geared ring	Z					
Gear treatment	1					
Surface coating	2					

A protection against oxidation is applied.

MAINTENANCE

MAINTENANCE - LUBRICATION

GREASING HOLES

Radially or facially located, depending on design, these holes are generally tapped M10 x pitch . 1.00 and closed by plastic caps or Hc screws.

Remove these plugs before fitting the slewing ring with grease nipples or linked to a centralized lubrication system.

Caution : the filler plug for the rolling elements has a blind tapped hole which is not a greasing hole.

REGREASING METHODS

Whenever the application allows it, greasing must be carried out during rotation at slow speed, on two revolutions minimum, through all the greasing holes.

GREASING FREQUENCY

Raceway and gear

The greasing frequency varies according to utilization and environment. We recommend regreasing every 150 hours in normal usage. This frequency is to be reduced to 50 hours when the conditions of application are severe or if the environment is dusty or wet.

Greasing is required, before and after a long idle period.

Regrease every 6 months, while rotating, during prolonged idle periods.

GREASE QUANTITY

Raceway :

The grease quantity is defined by the Engineered Department whenever a detailed bearing calculation is provided.

Approximate practical formula to determine the minimum necessary quantity "Q" in cm³ :

$$Q = 0,005/3 \times D \times H \text{ with :}$$

D = raceway mean Ø of the bearing in mm.

H = overall height of the ring in mm.

In all cases, a light extrusion of the new grease must appear at the protection seal lips.

Gear

The grease must entirely cover the flank of the pinion and of the ring gear whether applying by brush or spraying.

SPECIFIC APPLICATIONS

Upon request, the ROLLIX Engineering Department will provide solutions for extreme conditions : temperature, speed, etc.
See our data sheet ITR 551.

CORRESPONDANCE TABLE

According to our experience, the grease mentioned in the below table are compatible with each other and with the components of the bearings.

It is possible to use other lubricants provided that you are sure of their compatibility with the ROLLIX standard recommendation beforehand.

Greases containing molybdenum disulphide MoS₂ are strictly forbidden.

	ARAL	Aralub LFZ1
Aralub HLFP2	MOTUL/BEICHEM	Berlilit GA 400
Rhus L 474/2	BP	Energol WRL/GK 154 GS
Energol LS - EP2	CASTROL	
Grease UMX	ELF	Cardrexa DC1
Epexa 2 / Epexell 2	ESSO	Surrel Fluid NX
Beacon EP2	MOBIL	Mobilvac 81 or Mobilgear OGL 09
Mobilux EP2	SHELL	Malléus Fluid D
Calithia EP2		

This table is subject to change in accordance with the manufacturers' research works.

MAINTENANCE

PREVENTIVE MAINTENANCE

PROTECTION SURVEY

A visual examination makes it possible to ensure the integrity of the protective seals :

- absence of excessive stretch or tears,
- correct positioning,
- wear of the friction lip.

If necessary, replace the seal.

After regreasing, wipe clean residue of old grease and check for pollutants such as sand, coal, metallic particles, etc.

FASTENER SURVEY

It is particularly important to check that the required preload level of the bolts is still maintained as the fasteners of the slewing rings are essentially working in fatigue.

ROLLIX recommends to retighten the fasteners after the first two to four months of utilization and then proceed to a systematic yearly check.

If any bolt is found loose, a further in deep examination is essential. The necessary preservative measures must then be exercised.

Some regulations impose the replacement of fasteners every seven years or every 14 000 working hours.

In any case, refer to local rules and regulations enforced connected with the application.

ORIENTATION SURVEY

During cleaning prior to regreasing of the gear :

- Check carefully for any foreign body at the tooth root, ring and pinion.
- Check the even load distribution of the pinion on the entire width of the ring gear and correct the alignment of the axes if needed.
- Check the backlash value.

UTILIZATION LIMITS

CHECKING THE DEFLECTION UNDER LOAD

ROLLIX delivers its bearings with a preload ensuring proper functioning and optimum safety. During the product life, the preload decreases resulting in a noticeable increase of deflection under load. The bearing must be replaced when the deflection becomes incompatible with the proper functioning of the machine and with the required safety conditions for the type of material used.

ROTATION SURVEY

To quantify the wear factor, it is necessary to know the deflection under load.

- In new condition : J₀
- At time of survey : J₁

These measurements are made under the same initial conditions after having checked the tightening of fasteners (see chapter *INSTALLATION, Tests - Inspection*).

It is most advisable to register the measured values in the maintenance logbook specific to the machine.

Wear is the difference : $u = J_1 - J_0$.

- The bearing must be placed under survey when : $u \geq J_0$.
- Its replacement must be considered when : $u \geq 1,5 J_0$.
- and it is required when : $u \geq 2 J_0$.

In any case, refer to laws and regulations in force pertaining to the application in the concerned country.

The "slewing ring" product is a high technology product selected for precise parameters. It was designed and manufactured to the ISO 9000 standard and supplied based on the informations given in the questionnaire IT ETR 911.

It will give you trouble free service if the operating conditions are in line with "ROLLIX" recommendations.

You are a designer, an installer or a retailer, it is your responsibility to check that your or your user's need have been correctly identified in our questionnaire IT ETR 911, that the installation requirements and our product maintenance conditions have to be fully respected.

In order to help you, we enclose a check-list which although not comprehensive, covers the minimum essential checks which have to be carried out in all cases.

In addition we suggest you make yourself aware of our guarantee conditions and their limitations.

CHOICE OF THE SLEWING RING

To choose a suitable slewing ring, did you take into consideration :

- the nominal loads ☐
 - the overloads due to : ☐
 - wind ☐
 - snow ☐
 - operating conditions ☐
 - the loads due to dynamic effects ☐
 - peak load ☐
 - test overload ☐
- This for :
- the raceway ☐
 - the gear ☐
 - the bolting ☐
 - the maximum utilization speed ☐

On receipt,

be sure that the slewing ring you receive is the one you have ordered (identification plate).

Storage conditions

- During the storage time, has the product been protected against external contamination ? ☐
- If storage has exceeded 18 months, has the slewing ring been regreased before installation ? ☐

Before assembly,

be sure that the product has not been subjected to shock loads resulting in an alteration of its characteristics (irreversible deformation) :

- seals are in place ☐
- seals are not damaged (cut) ☐
- your handling equipment are suitable for the product : ☐
- quality ☐
- size ☐
- weight ☐

During assembly,

check :

- the fitness for the supporting base ☐
 - the dimensions of the structure ☐
 - the position of the filler plug ☐
 - the position of the hardening junction ☐
- in relation to the axis of maximum moments.

During fastening,

check :

- the grade of screws and bolts ☐
- the numbers of bolts used ☐
- the specified tightening torque ☐
- that the tightening torque is achieved using properly lubricated threads ☐
- that split, fan-shaped or elastic washers are not used ☐
- that hardened flat washers are used if required ☐

Assembly of the pinion gear (if necessary),

check :

- the pinion corresponds to the gear of the slewing ring ☐
- there is no risk of interference ☐
- the minimum backlash is maintained ☐
- the measurement is determined at the point of : ☐
- maximum offset of the external gear ☐
- maximum offset of the internal gear ☐
- the slewing ring / pinion center distance cannot vary ☐
- the contact area of the pinion on the slewing ring gear face is uniform ☐

Before operation,

be sure :

- the maximum slewing ring speed will not exceed the calculated value ☐

- no objects will foul the slewing ring rotation ☐
- no objects will damage the seals ☐
- the slewing ring and its pinion do not cause any danger ☐
- to material ☐
- to people ☐
- that protection complies with the recommendations of 89/392 CEE ☐

check :

- the deflection under the maximum design load and record the results ☐
- the rotation is without abnormal noise or tight spots ☐

After operation,

be sure :

- no deformation can affect the functioning of the assembly ☐
- no deformation can decrease the product life ☐

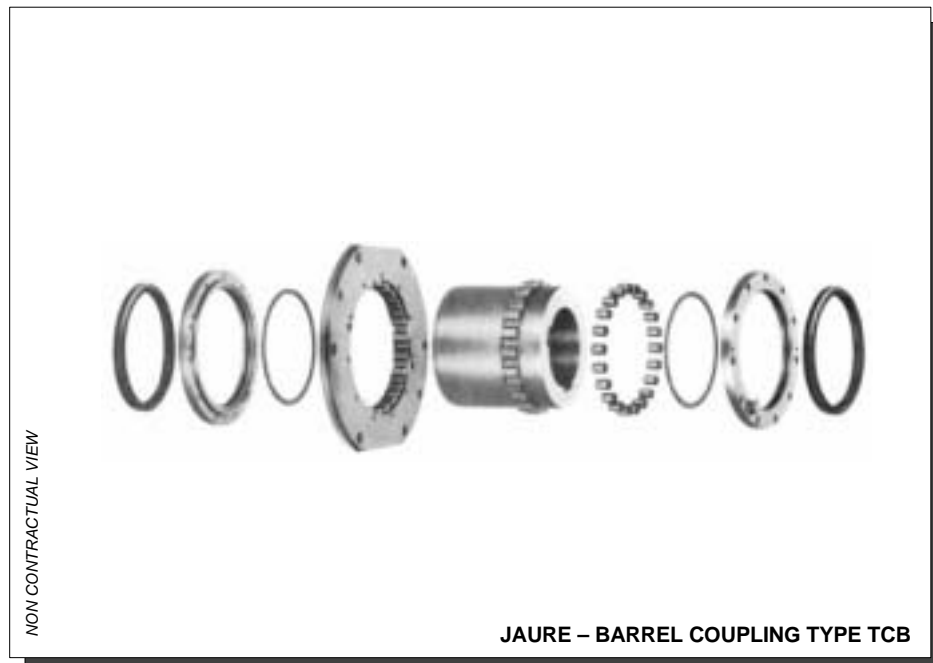
In operation,

be sure that the user :

- knows the lubrication specifications and in particular : ☐
- type of grease ☐
- frequency of lubrication ☐
- the method of regreasing ☐
- and this for : ☐
- the rolling elements ☐
- the gear ☐
- will observe the condition of seals ☐
- knows the frequency ☐
- of checking bolt tightening ☐
- of bolt replacement ☐
- knows the maximum permissible clearance in the product before dismounting ☐
- or the designed maximum clearance allowable ☐

4.18 BARREL COUPLING

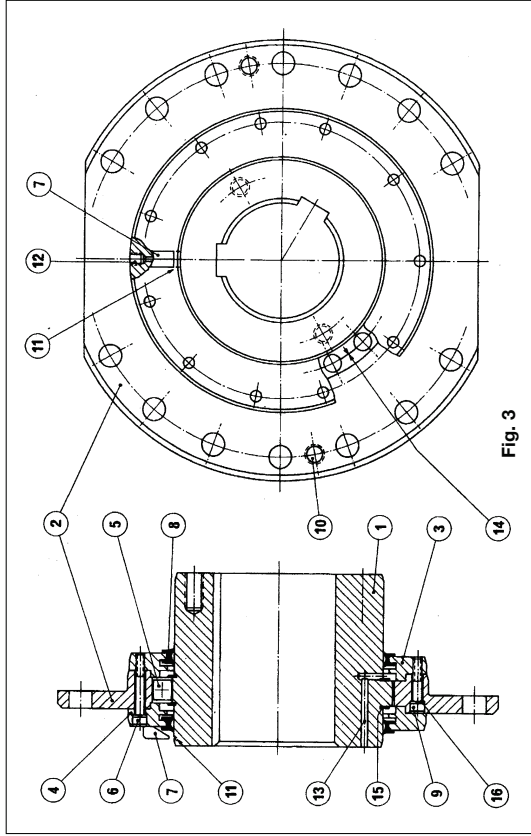
Location	ECL Code	reference
36T tapping tool ass'y	1-10-178-70	TCB 400



TCB BARREL COUPLINGS

INSTALLATION AND OPERATING INSTRUCTIONS

EXPLODED DRAWING



- 1. Hub
- 2. Sleeve
- 3. Inner cover
- 4. Outer cover
- 5. Barrel
- 6. Allen screw
- 7. Wear and axial adjustment indicator
- 8. Special seal
- 9. Allen screw
- 10. Threaded holes for disassembly
- 11. Wear limit grooves
- 12. Grease connection
- 13. Grease overflow
- 14. Assembly reference
- 15. Barrel guide rings
- 16. Grower washer

DIAMETERS AND PARAMETERS.

STANDARD TCB

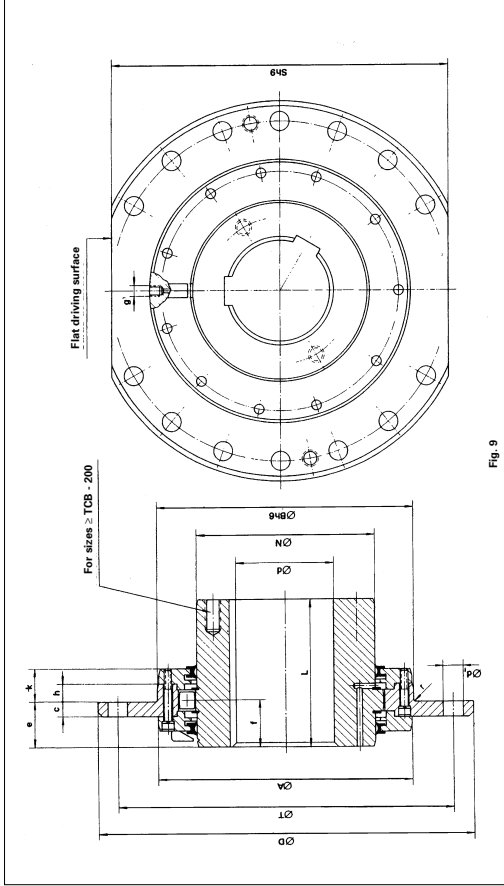


Fig. 3

Table 4. Technical data and general dimensions of the standard TCB.

TCB TYPE	TN Size	TN (Nm)	F _r Adm. Radial load (N)	max min d ₁ d ₂	D	L	L min.	N	A	B	S	e	f	c	r	h	k	T	d ₁	max axial displ. mm	Wt Kg.	J Kgme
25	4.500	14.500	65	38	250	95	85	95	159	160	220	42	44	12	2,5	16	31	220	15	3	12	0,06
50	6.000	16.500	75	48	280	100	85	110	179	180	250	42	44	12	2,5	16	31	250	15	3	19	0,13
75	7.500	18.500	85	58	320	110	95	125	199	200	280	45	46	15	2,5	17	32	280	19	4	23	0,17
100	9.000	20.000	95	58	340	125	95	140	219	220	300	45	46	15	2,5	17	32	300	19	4	27	0,28
130	15.500	31.000	105	78	360	130	95	160	239	240	320	45	47	15	2,5	19	34	320	19	4	33	0,36
160	19.500	35.000	120	78	380	145	95	180	259	250	340	45	47	15	2,5	19	34	340	19	4	42	0,48
200	24.000	38.500	135	98	400	170	95	200	279	280	360	45	47	15	2,5	19	34	360	19	4	54	0,66
300	28.000	42.000	145	98	420	175	95	220	309	310	380	45	47	15	2,5	19	34	380	19	4	70	0,93
400	38.000	49.000	175	98	450	185	120	260	339	340	400	60	61	20	2,5	22	40	400	24	4	95	1,45
500	61.400	92.000	195	98	510	220	125	290	389	400	460	60	61	20	2,5	22	42	460	24	6	146	2,86
600	70.000	115.000	205	118	550	240	125	310	419	420	500	60	61	20	2,5	22	42	500	24	6	162	3,93
1.000	120.000	125.000	230	138	580	260	130	350	449	450	530	60	61	20	2,5	22	42	530	24	6	195	5,63
1.500	180.000	150.000	280	158	650	315	140	415	529	530	580	65	66	25	2,5	27	47	600	24	6	305	11,0
2.600	310.000	250.000	300	168	680	350	145	445	559	560	600	65	70	25	4	34	54	630	24	9	360	16,0
3.400	400.000	300.000	315	198	710	380	165	475	599	600	640	81	85	35	4	34	56	660	28	8	408	20,0
4.200	500.000	340.000	355	228	780	410	165	535	669	670	700	81	85	35	4	34	56	730	28	8	580	34,5
6.200	685.000	380.000	400	258	850	450	165	600	729	730	760	81	85	35	4	34	59	800	28	8	715	52,0

- 1) During start-up, couplings can admit 200 % of nominal torque capacity.
2) Max. holes for execution with keyways according to DIN 6885/1. For other types of joints consult our Technical Department.
Maximum angular displacement of axes: $\pm 1^{\circ} 30'$
g= lubrication point
Up to size 160: R. 1/8" Gas, after size 200: R. 1/4" Gas.

FLANGE HOLES

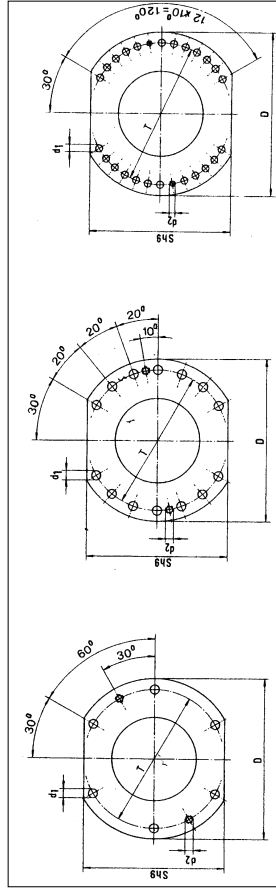


Fig. 10. Position of holes
Sizes 25 ... 600

Fig. 11. Position of holes
Sizes 1,000 ... 1,500

Fig. 12. Position of holes
Sizes 2,600 ... 5,200

CABLE DRUM FLANGE, COUPLING SIDE

The machining of the cable drum flange will be made according to Figs. 10, 11 or 12. The rest of dimensions according to Table 5.

The quality of the flange material will be St 52 - 3.

Table 5

TYPE	D	T	S	a	d ₁	Thread	d ₂	d ₃	p	Min. n
TCB			F8	min			F8			
25	250	220	220	25	15	M12	160	10	3	10
50	280	250	250				180			
75	320	280	280				200			
100	340	300	300				220			
130	360	320	320	30	19	M16	240	10	3	10
160	380	340	340				260			
200	400	360	360				280			
300	420	380	380				310			
400	450	400	400	40	24	M20	340	10	3	10
500	510	460	460				400			
600	550	500	500				420			
1.000	580	530	530				450			
1.500	650	600	580	50	24	M20	530	20	5	25
2.600	680	630	600				560			
3.400	710	660	640				600			
4.200	780	730	700				670			
6.200	850	800	760	60	28	M24	730	35		

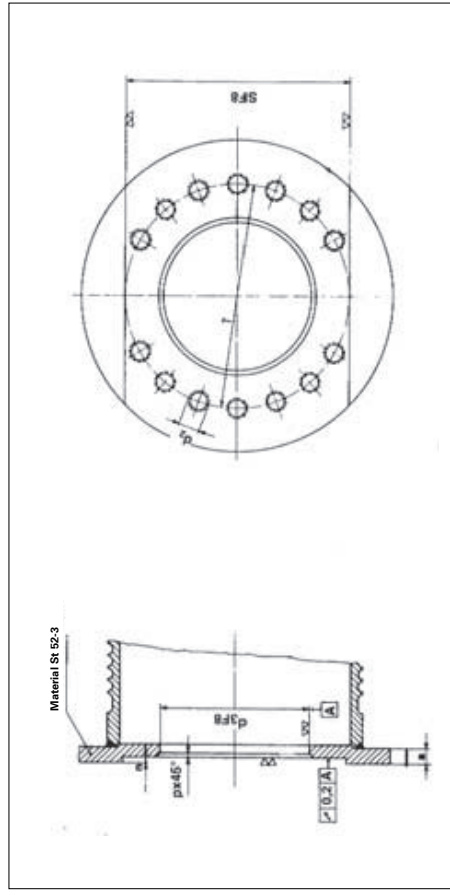


Fig. 13 Coupling side flange for cable drum.

MOUNTING AND MAINTENANCE INSTRUCTIONS

- The TCB barrel coupling is supplied fully assembled. The lubricant with which the coupling is supplied serves to facilitate the assembly of the different components, but a suitable lubricant is necessary for the correct functioning of the coupling.
- Axial forces, as a consequence of component resulting from the inclination of the cables, must be absorbed by the drum support bearing on the opposite the coupling (Pos. a, Fig. 4 in the catalogue) and the cart structure. The deformations that may exist during operation at full load must not be greater than the maximum axial displacement indicated in Table 4.
- **Important:** If the coupling is supplied without machining, it will be necessary to dismount it in order to carry out the corresponding machining. Once machined, during mounting the hub and sleeve must be connected lining up the mark on the hub with the mark on the sleeve with that on the sleeve (See mounting reference Pos. 14, Fig. 3 on Page 1). After machining, apply an antioxidant.
- The screws for fixing the coupling to the drum and those for the covers must be at least of quality 8.8. For the corresponding tightening torque values, see Table 7.

Table 7. Tightening torques

Thread	M8	M10	M12	M16	M20	M24
Max. tightening torque (Nm)	26	51	89	215	420	725

in quality 8.8.

- Use the threaded holes to handle the parts, avoiding causing blows to the parts.
- The coupling must be greased since it is supplied without the grease necessary for its correct operation.

1. ASSEMBLY OF COUPLING ON GEARBOX SHAFT

- a) By means of keyways:
- Both the shaft and the interior of the hub must be free from soiling.
 - To easy the assembly and in order to avoid the damage of seals, the complete coupling may be heated in an oil bath to a maximum temperature of 80 °C.
 - Set the hub on the shaft, with care.
 - The sleeve must allow axial displacement.
- b) Joint by mean of interference, without keyway:
- It is necessary to previously disassemble the outer cover, sleeve, guide ring and barrels.
 - Prior to the assembly of the coupling, its component parts must be carefully cleaned.
 - Position the outer cover, with its seal, previously on the shaft.
 - If it is envisaged that there will not be space to mount the fixing screws, these may be previously introduced in their housings. Check the distance Y (Fig. 15); for this purpose, see Table 8.

Table 8. Y distance.

Coupling size Min Y (mm)	25-75 50	75-300 55	400-1.000 70	1.500 80	2.600-6.200 90
-----------------------------	-------------	--------------	-----------------	-------------	-------------------

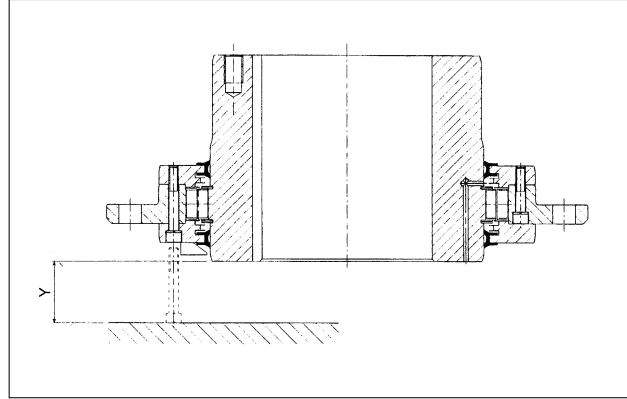


Fig. 15.
Distance necessary screw removal.

- b) Connection by means of interference, without a keyway (contd.):
- Heat the coupling hub progressively to the required temperature (depending on the interference). By way of guidance, a temperature of 200 - 250 °C is usually sufficient. This temperature should not be exceeded, even locally, taking care to prevent contact between the cover seals and the hot hub, as the seals may be damaged by the high temperature.
 - Set the hub on the shaft until it reaches its designated position. The hub must not come into contact with any seal as this could be damaged due to the high temperature. Continue with the assembly after allowing the hub to cool.
 - Mount the sleeve on the hub respecting the mounting mark Pos.14, according to Fig. 3.
 - Introduce the barrels, fixing them by means of the guide ring.
 - Mount the cover, lining the indicator up with the respective mark on the hub.
 - The sleeve must allow axial displacement.

In the case of dismounting by oil injection, consult our Technical Department.

2. AXIAL TRIMMING OF COUPLING. ANGULAR ALIGNMENT OF DRUM.

Prior to drilling the holes for the fastening of support Pos.a, Fig. 4, axially fix the position of the drum with respect to the coupling's hub. To this end, axially line up the indicator fixed on the cover with the groove on the hub, according to Fig. 16. During assembly, axial displacement must not exceed 10 % of the maximum nominal value admitted by the coupling, according to Table 4.

After this, the alignment of the rolling drum with respect to the gearbox output shaft will be made, checking the distance "X" by measurement with a ruler, positioning it at four pour points at 90° according to Fig. 17. The difference between the maximum and minimum values of "X" must be less than the value shown in Table 9.

The distance from the hub side to the coupling sleeve side must coincide with: $(e - c) \pm 10 \%$ max. axial displacement, according to Fig. 9.

In the same way it is possible to align both axially and angularly by means of the use of a laser, placing the bases on the drum bearing support and on the gear reducer. (The values e, c are shown in table 4).

Table 9. Difference in distance X (mm)

Drum size < 1 metre > 1 metre	Distance between max. and min. X < 0,5 mm > 0,8 mm
-------------------------------------	--

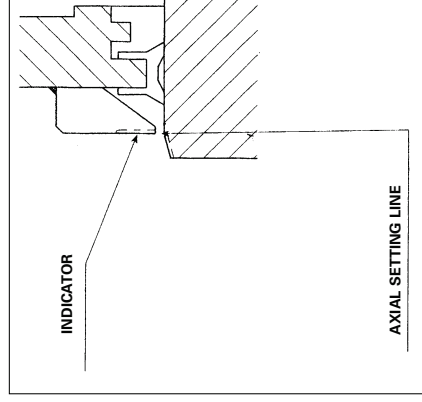


Fig. 16 Axial positioning

3. GREASING.

Once the assembly is finished, ensure that the coupling is greasing before coming into service. Use must be made of a lubricant of the following characteristics (for temperatures between -20 °C and + 80 °C, consult Jaure for temperatures outside this range):

Reference	Manufacturer
Klüberlub BE 401 - 1501	Klüber
Atlanta	Verkol
Mobilux EP-2	Mobil
Energ grease LS-EP2	BP
Alvania EP-2	Shell
Norva HT2	Esso
Renolit H443-HD88	Fuchs DEA

Lubrication will be carried out using a prolongation of the greasing tube inserted in the corresponding orifice of the outer cover. Grease must be inserted until it comes out of the overflow aperture, situated at the opposite end of the hub, Pos. 13, Fig. 3.

For the quantities of grease to be used in each size, see Table 10:

Table 10 Quantity of grease per coupling.

Size of coupling Quantity kg	25	50	75	100	130	160	200	300	400
Size of coupling Quantity kg	0,08	0,10	0,12	0,14	0,15	0,17	0,19	0,23	0,45
Size of coupling Quantity kg	500	600	1000	1500	2600	3400	4200	6200	
	0,54	0,57	0,65	0,72	0,9	1,0	1,3	2,0	

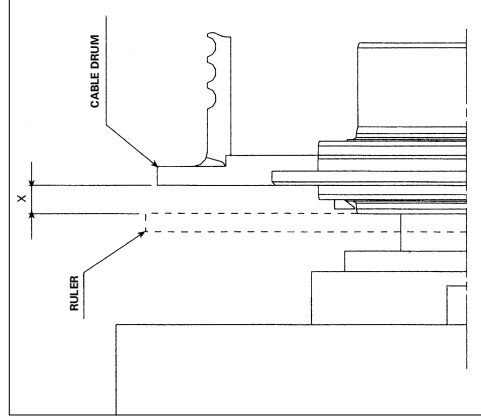


Fig. 17 Coupling alignment

4. MAINTENANCE

Greasing: The grease will be completely renewed each 2000 or 3000 hours of operation, depending on service conditions, or at least once a year. To this end, introduce new grease through the input orifice, expelling the used grease through the overflow outlet.

Periodic inspections, check the following at least once a year:

- The tightening torque of the screws must be as indicated. If any screw is observed to be in a bad state, it is recommended to replace all the screws.
- Internal wear of the toothing. Wear may be checked by means of the position of the indicator mark over the marks on the hub (Fig. 18). The relative position of the two marks reveals the wear of the flanks.

The coupling is originally supplied with the indicator centred on the hub marks (Pos. a).

When the limit is reached (Pos. b), it is necessary to replace the complete coupling.

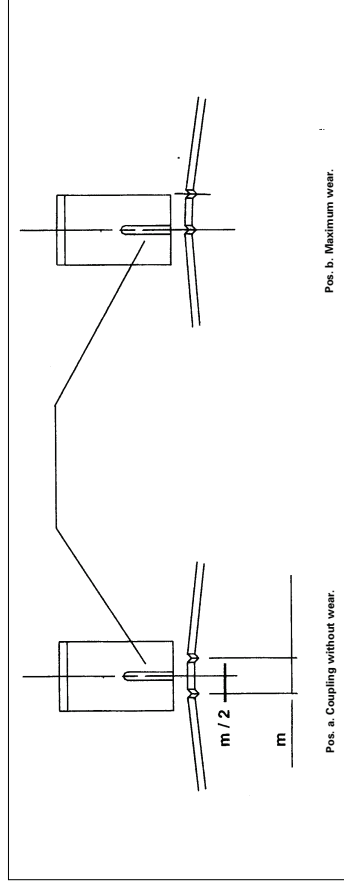


Fig 18 Wear of the coupling.

Table 11 shows the maximum wear values permissible for reversible load applications typical in the translation of a container crane. For single load direction applications, the amplitude between marks must be multiplied by two. Except where expressly requested, the marks supplied are those to be used in reversible applications.

Table 11. Control of coupling wear

Coupling size Max. wear m / 2 (mm)	25	50	75	100	130	160	200	300	400	500	600	1.000	1.500	2.600	3.400	4.200	6.200
	4	4	4	4	6	6	6	6	6	8	8	8	8	8	8	8	8

- Axial setting: Checks the distance "X" according to Fig. 13. If this distance is greater than 10 % of that shown in Table 4, the position of seating of the support-bearing must be reset.

- Control of seals: Replace the seals if any deterioration is observed in their lips.

4.19 ALUMINE MEASURE DRA O

Location	ECL code	Reference
Anode covering feeding ass'y / Alumine measure	1-10-331-82	DRA O 500

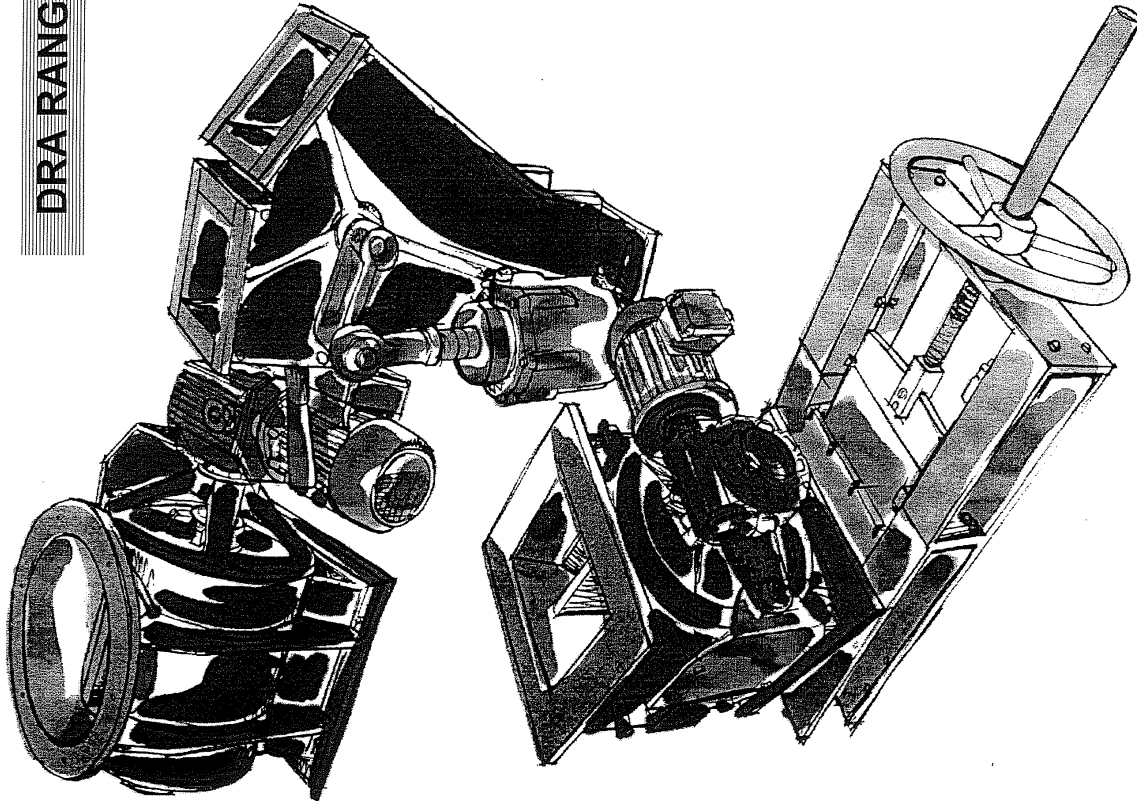


ACETT

constructeur

ROTARY FEEDERS

DRA RANGE




INSTALLATION START UP AND MAINTENANCE


NI DRA 98 06 G13

SAFETY INSTRUCTIONS


- Read the instructions carefully before starting assembly and start-up work.
- Make sure you comply strictly with all safety instructions marked as follows in this documentation:




ELECTRICAL DANGER, for example, for all work performed with power on.



DANGER OF MUTILATION, amputation of a limb.



MECHANICAL DANGER, for example, for jobs performed on lifting equipment.



IMPORTANT NOTES: to obtain secure and reliable operation; for example, preliminary adjustments before start-up.

REMEMBER:



Rotating parts on machines can cause serious injury or death.



Parts conducting electrical currents can electrocute.



Only qualified personnel should do assembly, connection and maintenance and repair work, in compliance with:

- the instructions in this documentation;
- the instructions in the documentation for the various components (appendices).
- safety and accident prevention requirements of national and regional legislation.

CONTENTS

CONTENTS

	Page
SAFETY REGULATIONS.....	3
GENERAL NOTES (GUARANTEES).....	5
1 - STORAGE.....	6
2 - USE.....	7
3 - INSTALLATION.....	8
3.1 BEFORE STARTING.....	8
3.2 MOUNTING.....	8
4 - START-UP.....	10
5- INSPECTION, TESTING AND MAINTENANCE.....	11
5.1 BEFORE STARTING.....	11
5.2 LUBRICATION.....	11
5.3 INSPECTION AND TESTING AFTER START-UP.....	12
5.4 RUNNING MAINTENANCE.....	12
6 - AFTER-SALES SERVICE.....	13
● COMPONENT CROSS-SECTIONS	
● APPENDICES	
Supplied on a case-by-case basis, or in accordance with detailed specifications.	

GENERAL NOTES

General notes concerning guarantee, waste processing, etc.

It is essential to comply with the instructions and notes in this documentation in order to obtain proper operation and to have the right, where necessary, to make claims under the terms of the guarantee. The requirements concern standard operations. Failure to comply with these recommendations can give rise to premature wear or damage, and may render the manufacturer's guarantee null and void.



- Each appliance is inspected and tested, and bears a serial number engraved either on the manufacturer's plate or on the side of the upper flange of the casing.
- The manufacturer reserves the right to modify the characteristics and construction of its appliances, if technical developments so demand.
- When you receive the consignment, make sure that the appliance has not been damaged during transport. If it has, then immediately register the usual reservations with the transport company.
- Lifting equipment must be suitable for the weight of the items to be installed.
- Waste processing (take account of requirements in force).



- The gear case, shafts and roller bearings of the appliance must be converted to steel scrap. Cast iron parts must also be converted to scrap if there are no special requirements.
- Recover used oils.

STORAGE

1 - STORAGE

Appliances must be stored in a location where they will not be exposed to impacts, damp (< 80%) or cold (temperature higher than - 20°C).

The unpainted parts of appliances (flanges, etc) must be protected, oiled or varnished.

LONG-TERM STORAGE

Before long-term storage, take the following precautions:

- enclose the appliance in sealed packaging (such as heat-weldable plastic, for example) with a sachet of desiccant inside;
- with reduction gears, follow the manufacturer's instructions: fill completely with oil, and provide due warning for start-up.

2 - USE

“ CONVENTIONAL ” Series

Includes rotary feeders of the following type:

- DRA.O Rotary feeder with direct pass with rotor open;
- DRA.F Rotary feeder with direct pass with rotor closed;
- DRA.L Rotary feeder with lateral pass with rotor open.

Rotary feeders (DRA) are used, depending on the application, as rotary sluices, cellular chambers or batching chambers in bulk product handling installations. Their design with separated bearings ensures good impermeability to dust (location under filter; cyclone, cyclic filter, etc). They are designed for gravitational flow or pneumatic transport of dry powders or granules. The lateral-passage version can be used for pneumatic transport without an output box.

Rotary feeders may be damaged if used for other applications, thereby relieving the manufacturer of liability.

3 - INSTALLATION

At the location of use, it is preferable to ensure easy access to appliances for inspection, testing, maintenance and repair work.
If necessary, a foot-bridge should be provided for the purpose.

Remember that:

Each appliance is delivered ready to use.

- ✎ The reduction gear has been filled with oil for the first time.
- ✎ The joint boxes have been greased (as per the table of recommendations; refer to the maintenance section).
- ✎ Ballrace bearings are sealed and greased for their entire working life.
- ✎ The rotor/stator internal clearances have been adjusted in factory.

3.1 BEFORE STARTING

REMEMBER

Check that:

- the information on the control unit's data plate corresponds with the network's characteristics.
- the appliance has suffered no damage during transportation or storage.

3.2 MOUNTING



- The rotor can always rotate; take all necessary safety measures to protect workers. Rotor blades can cause serious injury.

✎ Before mounting, remove the shaft protectors and use common-place diluting agent to clean off the anti-corrosion product that may coat the extremity of the shaft (in the case of appliances with a bare shaft) and the surfaces of flanges. Make sure that the diluting agent does not come into contact with the lips of sealing rings.

✎ Place relatively flexible seals of good quality on each of the assembly flanges.

✎ For drive units with a lubricated reduction gear, check the oil level (refer to the reduction gear documentation), and **fit the sniffer plug at the top of the reduction gear** (plug placed in the motor's terminal box).

☞ Check for proper cooling of the motor:

The air intakes and outlets must be free of obstruction.



☞ **Make electrical connections as per the control unit manufacturer's instructions.**

This operation must be performed by qualified personnel.

- Choose the protection system and the power cables as a function of the information on the motor's data plate.
- Connect the cables and tighten the nuts of the terminals. If connection is performed without lugs, fit yokes.
- Connect the heat protection systems and the accessories.
- Ensure that the stuffing-box is properly impermeable.

The stuffing-box must be appropriate for the diameter of the cable used. The cable should be fed into the terminal box with a radius of curvature that prevents water from penetrating via the stuffing-box.

- Connect in accordance with the coupling information on the terminal box. Check the direction of rotation of the motor in relation to the arrow plated on a flange of the appliance.

- Grounding:

Comply with applicable national standards when making connections.

- **Check that no foreign bodies are blocking the circuit of the product and/or pneumatic transportation.**



START-UP

4 - START-UP

- Before start-up, check that no foreign body is blocking the circuit though which the product passes.
- If the appliance is fitted with an inspection port, make absolutely sure that it is locked shut before start-up.
- Take all necessary safety precautions to protect personnel before rotation starts: all openings in the appliance should be blocked or covered, and the transmission casing should be fitted.
- After long-term storage, uncouple the drive unit and turn the rotor by hand to make sure that rotation takes place without noise.



☞ Check that the control unit is ready to operate (level, sniffer, etc).

☞ Where appropriate, connect the degassing circuit.

- **Make absolutely sure that the motor is connected in accordance with the direction of rotation indicated by the arrow plated on to the flange of the appliance.**



☞ Connect the blower system in the case of appliances equipped with such (option).

☞ Connect the pressurisation system (option): adjust the upper pressure of 100 to 200 grams to the internal pressure of the appliance.

Pressure must absolutely be fed before pressurisation of the TP.

☞ Connect the rotation control system (option).

INSPECTION, TESTING AND
MAINTENANCE

5 - INSPECTION, TESTING AND MAINTENANCE

5.1 - BEFORE STARTING



- Cut-off the power supply by means of a circuit breaker that can be locked in position.



- Immobilise the rotor to ensure that it remains stationary: it can cause serious injury if it rotates.

5.2 - GREASING.

Make sure that mechanical and electrical installations instructions are complied with over time.

- Appliances fitted without lubricator: no particular maintenance.
- Appliances fitted with continuous lubricator: consult the supplier's data sheet.
- Once per month, grease the joint box or the sealing braids, depending on the case.

There are three different types of grease for commonplace applications:

- tan-colour multipurpose grease;
- white alimentary-standard grease;
- brown/grey high-temperature grease.

Grease correspondence table for ACETT appliances.

The appliances are delivered lubricated with UNIL-OPAL or IMPERATOR brand products for alimentary applications.

Lubricant	Temperature	Viscosity	UNIL-OPAL	IMPERATOR	BP	ELF	ESSO	MOBIL	SHELL	TOTAL
Multipurpose	-20°C +140°C	2	Grease 182DS		Enigrease multipurpose 2	Elf multi	Multipurpose grease L		Relinax A	Multi S 2
Alimentary contact	-25°C +160°C	2	Food grease 2	Mystik food						
High-temperature multi-	-20°C +180°C (260°C MAXI)	2	Thermoplex 2		Top charge	Multi HT 2	Unirex N	Mobil grease HT	Liplex EP2	Multi S THT 2
Low-temperature multi-	-40°C +140°C (260°C MAXI)	2	Siberia							
Very high temperature	+500° temperature maxi.	2	Alumix							
General purpose synthetic	-30°C +180°C	2	Synthese 400							

5.3 - POST-START-UP INSPECTION AND TESTING (APPROXIMATELY 50 HOURS OF OPERATION)

- Check that the appliance flange screws and the mounting, bracket, torque arm, reduction gear and motor screws, etc. are properly tightened.
- Check that no abnormal noises are heard during operation.
- For appliances equipped with sealing braids, check the stuffing-box rammer after 12 hours of operation.

5.4 - RUNNING MAINTENANCE

- Perform the period lubrication operations (lubricators).
- Appliance equipped with chain transmission: after removing the front panel of the transmission casing, grease the transmission chain with a multi-purpose grease, using a brush or aerosol, and check the tension of the chain.
- Appliance equipped with sealing braids: re-tighten the stuffing-box rammer every 250 hours of operation. If tightening proves ineffective and there is a leak, then replace the worn braids.
- Appliance equipped with pressurisation system: every week, check the cleanliness of the pressurisation circuit's regulating filter; bleed it where necessary. Check that it operates correctly. Make sure that the openings and pipework are not blocked.
- For control units, follow the manufacturer's instructions; perform drainage operations or check levels; top-up if necessary.

- Make sure that the venting hole of the sniffer plug is not blocked.

- Clean the motor's ventilation grilles.

- Grease the roller bearings of motors equipped with lubricators (refer to the motor's data plate for the frequencies at which the roller bearings should be lubricated, and for the type of grease to be used. If no instructions are given, then the motor roller bearings have been greased for life).

6 - AFTER-SALES SERVICE

Refer to the parts list and/or cross-referenced standard drawing.

Notes:

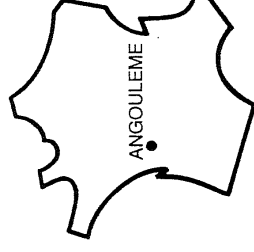
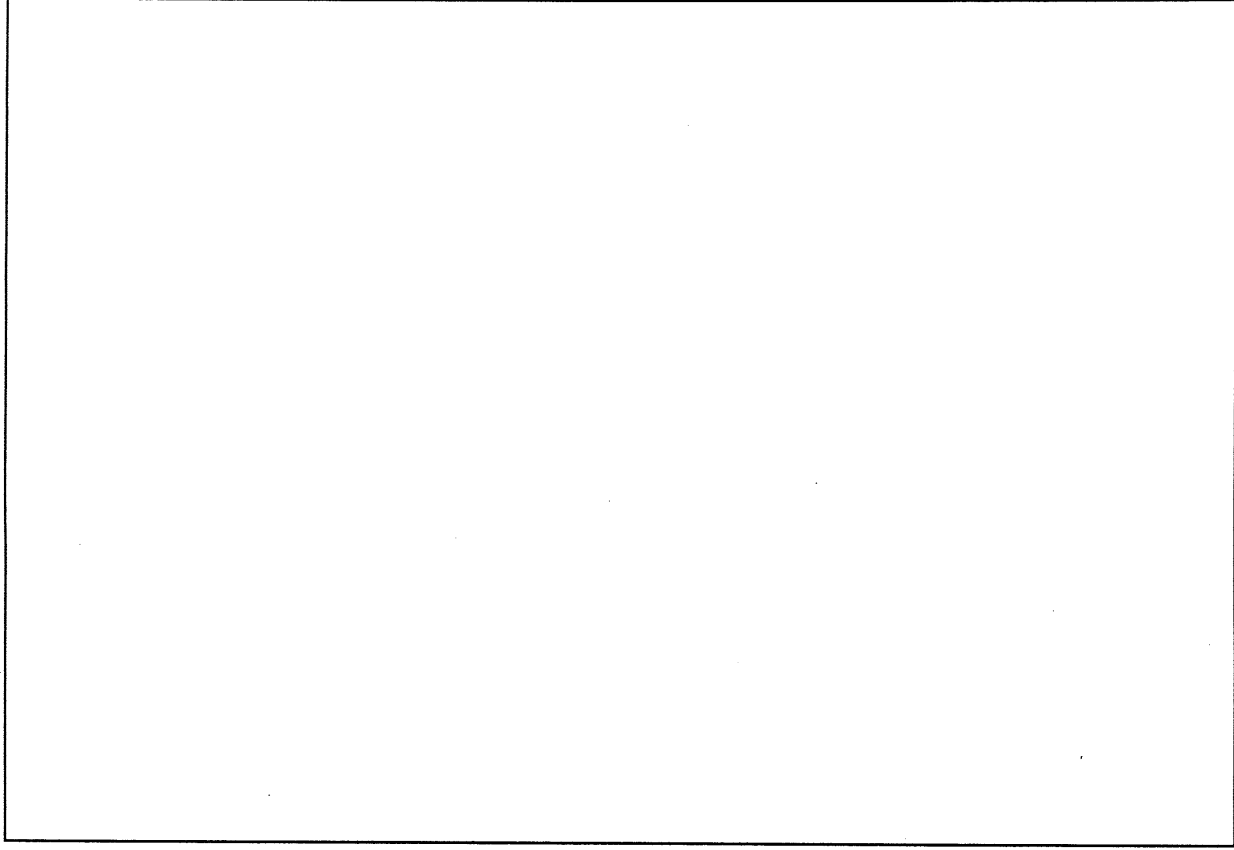
When calling for after-sales service, please state:

- the serial number engraved on the data plate and/or on the side of the upper flange of the appliance;
- if possible, the size of the appliance's inlet;
- when and under what conditions the failure occurred.

After-Sales Service Reference:

Stamp:

ACETT Sarrà
ZA "Les Montagnes"
B.P. 31 - 16430 CHAMPNIERS
FRANCE
Tél. 05 45 90 15 10 - Fax 05 45 90 15 19
RCS ANGOULÊME B 338 684 886 - Code APE 287 14



ACETT Sarl Z.A. Les Montagnes B.P. 31
16430 CHAMPNIERS - (NORTH ANGOULEME)



Address : ECL, 100 Rue Chaland
59790 RONCHIN - FRANCE
Phone : +33 (0)3 20 88 70 70
Fax : +33 (0)3 20 88 70 99
Email : contact@ecl.fr

MA'ADEN

POT TENDING MACHINE

MAINTENANCE MANUAL

CLIENT Contract : 25457-4230-POA-MJKT-0001
Manual : 25457-4230-V1A-MJKT-0123

ECL Contract : P1034
Manual : 1-10-961-16

VOLUME 2/3

Date	Rev.	Written by Name and Visa	Checked by Name and Visa	Approved by (Product Manager) Name and Visa
06/2011	00	Julien PROD'HOMME	Jerome MAREE	Bernard Kaszynski
09/2011	01	Samuel DHENNIN	Mickaël GARNIER	Philippe Vincent
02/2012	02	Julien PROD'HOMME	Jerome MAREE	Philippe Vincent

TECHNICAL DOCUMENTATION COMPOSITION

Manual	Reference
Installation	1-10-960-99
Operating	1-10-961-18
Maintenance	1-10-961-16
Spare parts	1-10-961-17

SUMMARY

Chapter	Description	Volume
1	General information	1/3
2	Technical and safety data sheets (Lubricants)	
3	Preventive maintenance	
4	Mechanical maintenance	
5	Hydraulic maintenance	2/3
6	Pneumatic maintenance	
7	Electrical maintenance	3/3
8	Air conditioning units	
9	Lifting unit	
10	Verification of welds	
11		
12		

ECL CONTACTS

Address	ECL Contacts	Name	E-mail
ECL France 100, rue Chaland 59790 Ronchin - FRANCE Phone : +33 (0)3 20 88 70 70 Fax : +33 (0)3 20 88 70 99 Email : contact@ecl.fr	Project Manager	Mr F. Pereira	frederic.pereira@ecl.fr
	Product Manager	Mr P. Vincent	philippe.vincent@ecl.fr
	Technical documentation Manager	Mr B. Kaszynski	kaszynski_b@ecl.fr
	Spare Parts Manager	Mr R. Collaudin	romuald.collaudin@ecl.fr
	After Sale Services	ecl_aftersaleservices@ecl.fr	

SUBMISSIONS REGISTER

Sub N°	Manual Revision	Sending Date	Return Date	Client Status	Complete Manual			Modified Pages		
					Paper	CD rom	FTP or E-Mail	Paper	CD rom	FTP or E-Mail
01	00	15/06/2011								
02	01	08/09/2011					1			

REVISIONS MANAGEMENT

Manual Rev.	Type *	Modified pages	Page Rev.	Observations
01	A	5.28 ; chap 10	00	Manual updated
	M	FRONT PAGE, 0-2, 0-3, 3-2, 3-3	01	
02	M	Front pages ; 0-3 ; 3-3	02	Manual updated
		4-10 ; 4-11 ; 5-2 ; 5-3 ; 5-4 ; 5-5 ; 6-1 ; 6-2 ; 6-3 ; 6-16 ; 9-0	01	
	A	9-3	00	Cables certificates added

(*) M = Modified document

C = Cancelled document

A = Added document

Note: The black squares are put to localise modifications on page for last revision.

PROPRIETES INDUSTRIELLES
ET MARQUES DEPOSEES
INDUSTRIAL PROPERTIES
AND TRADEMARKS

La conception de cet équipement est la propriété de ECL et toute information le concernant dans ce document est confidentielle. Par conséquent, toute reproduction ou copie de quelque façon que ce soit de ce document et de son contenu, sans permission écrite antérieure d'ECL, est strictement interdite.

The design of this equipment is the property of ECL and all information relating to it in this document is confidential. Therefore, the reproduction or copy in any manner of this document or of the drawings and schematics herein contained without the prior written permission of ECL is strictly forbidden.

Le nom social de ECL est de propriété industrielle. Le logo ECL et les marques déposées ECL[™] et Candi[™] appartiennent à ECL et ne peuvent être employés sans permission écrite antérieure d'ECL.

ECL's corporate name is proprietary. ECL's logo and the trademarks ECL[™] and Candi[™] belong to ECL. They cannot be used without the prior written permission of ECL.



HYDRAULIC MAINTENANCE

CONTENTS OF THE CHAPTER

HYDRAULIC GENERALITIES INFORMATIONS	5.1-1
HYDRAULIC DIAGRAM	5.2-1
DESCRIPTION AND OPERATION OF THE HYDRAULIC UNIT	5.3-1
METHOD FOR ADJUSTING UNIT AND HYDRAULIC FUNCTIONS	5.4-1
TABLE OF THEORETICAL ADJUSTMENT VALUES	5.5-1
PROCEDURE FOR HYDRAULIC FLUID FILLING	5.6-1
HYDRAULIC CYLINDER VENTING – EXAMPLE	5.7-1
KIT 60 L/MN FOR MEASURE & ADJUSTMENTS OF HYDRAULIC UNIT	5.8-1
THE SERVICEMASTER DEVICE	5.9-1
PREVENTIVE MAINTENANCE INSTRUCTIONS	5.10-1
FILTER RFM BN/HC	5.11-1
BREATHING BR110	5.12-1
THERMOSTAT RT 107	5.13-1
PRESSURE SWITCH TYPE BVS	5.14-1
FLOW REGULATOR TYPE QNPP	5.15-1
PROPORTIONAL P LIMITER TYPE BVP	5.16-1

CONTENTS OF THE CHAPTER

DIGITAL AMPLIFIER MODULE SD6	5.17-1
PROBE PT100	5.18-1
LEVEL SWITCH NWS	5.19-1
LEVEL SWITCH HYDAC	5.20-1
VALVE D4 1V W	5.21-1
VALVE D1 VW	5.22-1
PRESSURE RELIEF VALVE ZDV	5.23-1
HYDRAULIC MOTOR TYPE OMR	5.24-1
HYDRAULIC PUMP	5.25-1
HYDRAULIC CYLINDERS	5.26-1
HYDRAULIC POWER UNIT CE08L	5.27-1
FLUSHING PROCEDURE	5.28-1

5.1 HYDRAULIC GENERALITIES INFORMATIONS

STD-DOC GEN_HYD_GB rev 00 – april 2010

1. GENERAL PRECAUTION



WARNING

Assembly, installation, commissioning, tests, maintenance and elimination of faults:

may only be carried out by a “qualified person”

A qualified person is one with the necessary qualification, based on theoretical and practical knowledge of hydraulic, for the required activities as listed in the operating instructions. Refer to the “*GENERAL SAFETY AND PRECAUTIONS*” paragraph, described chapter 1 of this manual and especially to the following general information.

2. GENERAL INFORMATION



INFORMATION

Before start-up of the hydraulic unit:

- Check that cylinders motions are possible, all clamping are removed
- Check that nobody is present in working area
- Check the oil level
- Check leakages on all circuit (Connection of flexibles, unions, pump, ...)

During the start-up of the hydraulic unit :

- A progressive starting is imperative to avoid any damage to the flexibles, unions, pump
- Check that no leakage appears throughout the circuit

These checking will have to be made during the starting and in operation.



WARNING

Any hydraulic fluid leakage must imperatively be cleaned in order to avoid an accident (slip of anybody, pollution of the site, fire hazard, ...).

3. GUARANTEE



GUARANTEE

The guarantee applies only if the recommendation by ECL in this manual are used.

The use of any other hydraulic fluid is under the sole responsibility for the user.

5.2 HYDRAULIC DIAGRAM

ITEM	DESCRIPTION	QTY	DWG CODE	DWG REV	CLIENT NOTES
	1. MULTIPURPOSE POT TENDING MACHINE HYDRAULICAL DIAGRAM		1-10-858-24	05	
	1.1. MPTM HYDRAULICAL COMPONENTS LIST		1-10-858-26		
..	MULTIPURPOSE POT TENDING MACHINE	1	1-10-858-24		
...	HYDRAULIC UNIT ADJUSTING MANUAL	1	1-10-954-61		
....	HYDRAULIC UNIT ASS'Y	1	1-10-861-68		
A...	HYDRAULICAL TANK 300 LITERS ASS'Y	1	1-10-861-64		
A.0.	300 LITERS HYDRAULIC TANK - STAINLESS	1	1-10-861-63		
A.1.	BALL VALVE F.F. 0402 20 27 3/4"	1	0-01-325-81		
A.2.	INDICATOR LEVEL FSA 127.2.1/12	1	0-00-241-39		
A.5.	FILTER RFM BN/HC 661 B M 10 C 1.X/- V-BA	1	1-10-726-29		
A.6.	BREATHER BR110	1	1-10-565-92		
A.8A	THERMOSTAT RT 107 REF 17-513766	1	0-00-242-02		
A.8B	CAP REF 017-436066	1	1-10-220-64		
A.8C	POCKET REF 017-437066	1	0-05-242-00		
A.9A	PT100 PROBE REF:31042-01	1	1-10-732-71		
A.9B	POCKET REF.31392-00 1/2"BSPT INOX	1	1-10-732-72		
A10.	LEVEL INDICATOR NWS RCM 4033 L250	1	1-10-795-28		
A11.	LEVEL INDICATOR NWS RCM 4023	1	1-10-795-25		
A12.	CLOGGING INDICATOR REF REX 77-0062	1	1-10-698-37		
A13.	CLOGGING INDICATOR REF REX 77-0037	1	1-10-698-36		
A14.	LEVEL INDICATOR NWS RCM 4013	1	1-10-887-11		
A15.	BUTTERFLY VALVE JMC PN 16 31.250-DN50	1	0-01-325-67		
A16.	LIMIT SWITCH XCK-J10511	1	0-00-228-60		
B...	MOTO-PUMP PD060 MOTOR S180L	1	1-10-861-65		
B.0.	HYD PUMP PD060PB04SLS5AL20T00BPB00+	1	1-10-861-21		
B.1.	MOTOR 180L 22kW 400V 50HZ 4P B5	1	1-10-894-19		
B.2A	BELLHOUSING PK350/06/06 REF.103526060600	1	1-10-861-20		
B.2B	DRILLED CAST IRON SLEEVE D.32 H7, RCN	1	1-10-861-19		
B.2C	DRILLED CAST IRON SLEEVE D.48 H7, RCN	1	1-10-731-52		
B.2D	ELASTIC COUPLING 92 SHORE A	1	1-10-731-53		
C...	REGULATION BLOCK FLOWS/PRESSURES ASS'Y	1	1-10-887-65		
C.0.	DRILLED BLOCK 145x145x205	1	1-10-934-48		
C.1.	CHECK VALVE V-SP-Z-BE-1010-E-16-N	1	1-10-734-89		
C.2.	PRESSURE SWITCH BVS PM 22-350-D1	1	1-10-733-20		
C.3.	FLOW REGULATOR QNPP-M33-63-G24-D1	1	1-10-255-86		
C.4.	FLOW REGULATOR QNPP-M33-63-G24-D1	1	1-10-255-86		
C.5.	PROPORTIONAL P LIMITER BVPPM22-350-G24	1	1-10-255-92		
C.6.	PROPORTIONAL P LIMITER BVPPM22-350-G24	1	1-10-255-92		
C.7.	VALVE CV04-20-0-V5	1	1-10-255-95		

MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

ITEM	DESCRIPTION	QTY	DWG CODE	DWG REV	CLIENT NOTES
C.8.	VALVE CV04-20-0-V5	1	1-10-255-95		
C.9.	PRESSURE INTAKE SMK20-J 5/16-VK	1	0-00-349-10		
C10.	PRESSURE INTAKE SMK20-J 5/16-VK	1	0-00-349-10		
C11A	HYDR.MALE PUSH-PULL FD56-1062-12-12 06 A	1	0-04-333-02		
C11B	FEMALE PLUG 5657-12 3/4"-14	1	0-05-339-13		
C12A	HYDR.MALE PUSH-PULL FD56-1062-12-12 06 A	1	0-04-333-02		
C12B	FEMALE PLUG 5657-12 3/4"-14	1	0-05-339-13		
C13.	PRESSURE GAUGE REF.804444	1	1-10-735-06		
C14.	PRESSURE GAUGE REF.804444	1	1-10-735-06		
C15.	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
C16A	HYDR.MALE PUSH-PULL FD56-1062-12-12 06 A	1	0-04-333-02		
C16B	HYD.FEMA. PUSH-PULL FD56-1064-12-12 06 A	1	0-04-333-03		
C16C	MALE PLUG 5659-12 3/4"-14	1	0-00-339-18		
C16D	FEMALE PLUG 5657-12 3/4"-14	1	0-05-339-13		
C17.	AMPLIFIER MODULE REF 24VCC SD6312D21-AA	1	1-10-373-90		
C18.	AMPLIFIER MODULE REF 24VCC SD6312D21-AA	1	1-10-373-90		
D.0.	AIR/OIL EXCHANGER REF.LAC2 011 4 D C 0	1	1-10-902-18		
E...	CRUST BREAKER				
E.0.	DRILLED BLOCK 200x145x14	1	1-10-905-77		
E.0.	DISTRIBUTION BLOCK CRUST BREAKER ASS'Y	1	1-10-905-78		
E.1A	VALVE D 4 1V W 034 C 4 V J W	1	1-10-729-94		
E.1B	BENDEDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-03		
E.1C	BENDEDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
E.1D	SEAL OF CONNECTOR GDM 3-16	2	0-07-220-27		
E.2A	VALVE D 1V W 34 C V J W 75	1	0-05-325-94		
E.2B	BENDEDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-03		
E.2C	BENDEDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
E.2D	SEAL OF CONNECTOR GDM 3-16	2	0-07-220-27		
E.4.	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
E.5.	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
E.6.	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
E.7.	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
E.8A	HYD MALE PUSH PULL 1" REF.25FFP100BS143	1	1-10-512-07		
E.8B	PLUG HYD MALE PUSH PULL 1" REF.PDC25FF	1	1-10-513-63		
E.8C	HYD FEM PUSH PULL 1" REF.25FFS100BS143	1	1-10-512-05		
E.8D	PLUG HYD FEM PUSH PULL 1" REF.SDC25FF	1	1-10-513-60		
E.9A	HYD MALE PUSH PULL 1/2" REF.12FFP75BS143	3	1-10-511-91		
E.9B	PLUG HYD MALE PUSH PULL 1/2" REF.PDC12FF	3	1-10-513-61		
E.9C	HYD FEM PUSH PULL 1/2" REF.12FFS50BS143	3	1-10-583-23		
E.9D	PLUG HYD FEM PUSH PULL 1/2" REF.SDC12FF	3	1-10-511-58		
E1..	BREAKER BOTTOM HOLDING BLOC ASS'Y	1	1-11-035-62		
E10.	DRILLED BLOCK 95x95x50	1	1-11-035-32		
E11.	VALVE REF: SV16-20-0-V-24DG	1	1-10-559-71		
E11A	BENDEDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
E11B	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
E12.	PRESSURE LIMITER RDBA_LEV	1	1-11-035-28		



MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

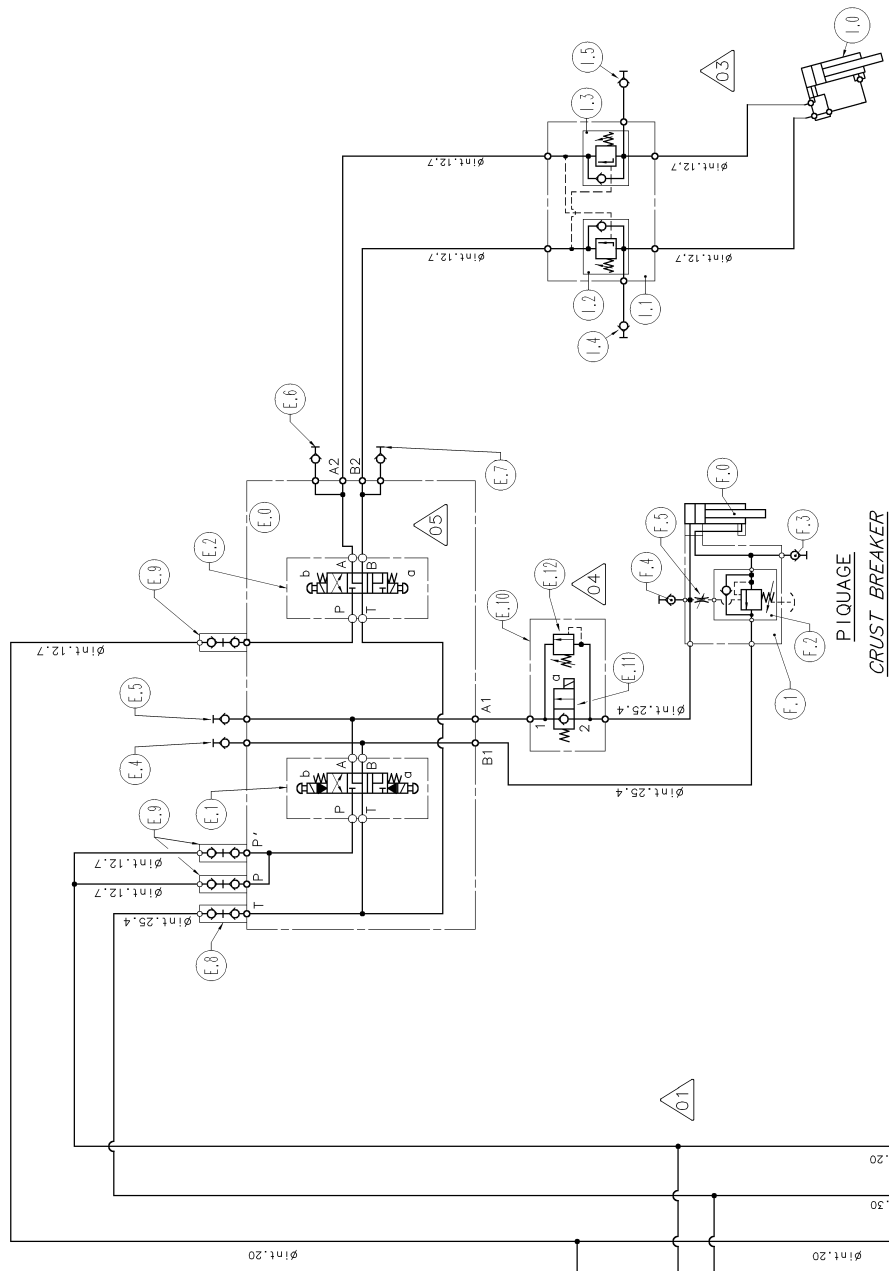
ITEM	DESCRIPTION	QTY	DWG CODE	DWG REV	CLIENT NOTES
F.0.	HYDRAULIC CYLINDER D.80X56 STROKE 4250	1	1-10-922-63		
F.0.	HYDRAULIC CYLINDER V80IG ASS'Y	1	1-10-922-64		
F.1.	SECURITY BLOCK CRUST BREAKER ASS'Y	1	1-10-922-30		
F.2.	VALVE IN CARTRIDGE CACG-LGV	1	1-10-565-31		
F.3.	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
F.4.	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
F.5A	SCREW HSHC M6-40-8.8 ISO 4762 ZINC PLATE	1	0-10-174-55		
F.5B	WATERPROOF NUT SEAL LOCK M6	1	1-10-751-96		
G...	EXTRACTING - TIGHTENING				
G.0.	DRILLED BLOCK 160x145x14 NG16 ET NG 6	1	1-10-698-25		
G.0.	DISTRIBUTION BLOCK EXTRACTING AND	1	1-10-728-70		
G.1.	VALVE D 4 1V W 034 C 4 V J W	1	1-10-729-94		
G.1A	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-03		
G.1B	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
G.1C	SEAL OF CONNECTOR GDM 3-16	2	0-07-220-27		
G.2.	VALVE D 1V W 004 C V J W	1	0-05-325-75		
G.2A	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-03		
G.2B	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
G.2C	SEAL OF CONNECTOR GDM 3-16	2	0-07-220-27		
G.3.	PRESSURE RELIEF VALVE ZDV-AB01-5-S0-D5	1	1-10-731-82		
G.4.	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
G.5.	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
G.6.	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
G.7.	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
G.8A	HYD MALE PUSH PULL 1" REF.25FFP100BS143	1	1-10-512-07		
G.8B	PLUG HYD MALE PUSH PULL 1" REF.PDC25FF	1	1-10-513-63		
G.8C	HYD FEM PUSH PULL 1" REF.25FFS100BS143	1	1-10-512-05		
G.8D	PLUG HYD FEM PUSH PULL 1" REF.SDC25FF	1	1-10-513-60		
G.9A	HYD MALE PUSH PULL 1/2" REF.12FFP75BS143	2	1-10-511-91		
G.9B	PLUG HYD MALE PUSH PULL 1/2" REF.PDC12FF	2	1-10-513-61		
G.9C	HYD FEM PUSH PULL 1/2" REF.12FFS50BS143	2	1-10-583-23		
G.9D	PLUG HYD FEM PUSH PULL 1/2" REF.SDC12FF	2	1-10-511-58		
H...	TIGHTENING				
H.0.	MOTOR REF OMR 315 - 151-0717	1	0-05-346-59		
I.	CRUST BREAKER TILTING				
I..	HYDRAULIC CYLINDER V80IH ASS'Y	1	1-10-949-35		
I.0	HYDRAULIC CYLINDER D.80X56 STROKE 400	1	1-10-942-77		
I.1	DRILLED BLOCK 100x100x80	1	1-10-948-75		
I.1.	SECURITY BLOCK TILT PITTING ASS'Y	1	1-10-948-76		
I.2	VALVE IN CARTRIDGE CABG-LHV	1	1-10-956-79		
I.3	VALVE IN CARTRIDGE CABG-LHV	1	1-10-956-79		
I.4	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
I.5	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
J..	EXTRACTING				
J...	HYDRAULIC CYLINDER V100JB ASS'Y	1	1-10-654-72		
J.0.	HYDRAULIC CYLINDER D.100X56 STROKE 3200	1	1-10-654-70		
J.1.	DRILLED BLOCK 110x95x95 1"SAE 6000 1" BS	1	1-10-698-24		

MA'ADEN

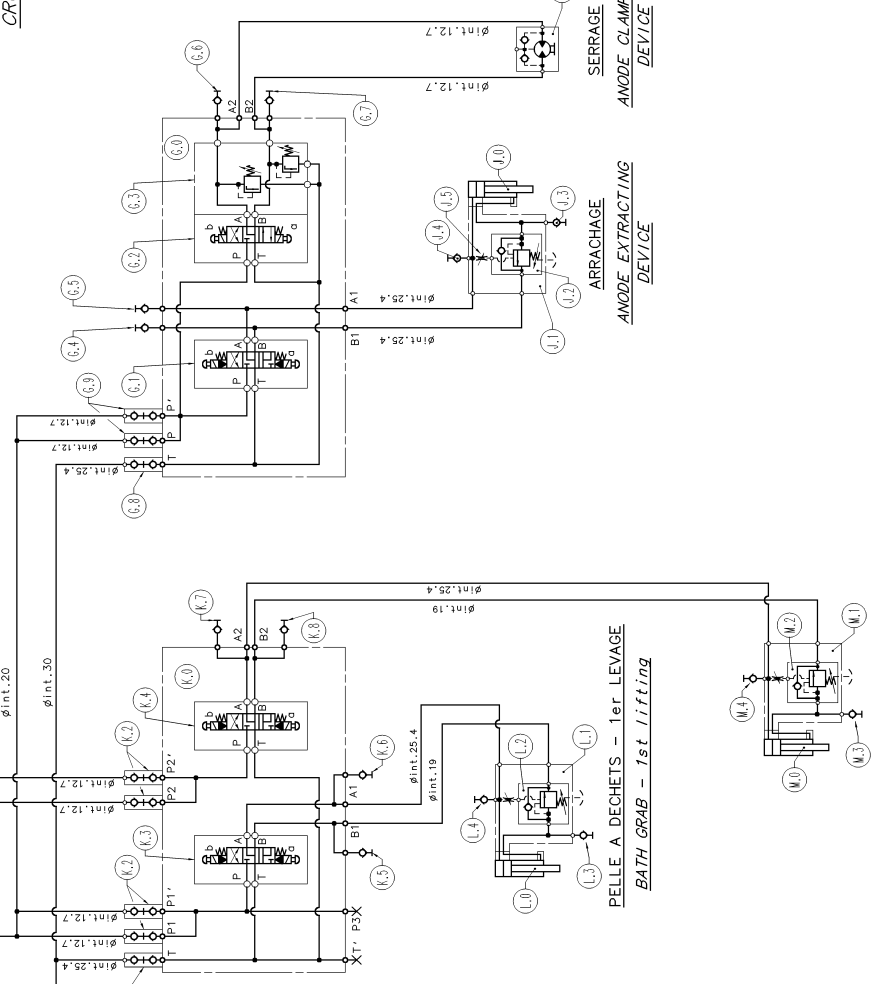
MAINTENANCE MANUAL OF THE POT TENDING MACHINE

ITEM	DESCRIPTION	QTY	DWG CODE	DWG REV	CLIENT NOTES
J.2.	VALVE IN CARTRIDGE CAEG-LFV	1	1-10-565-33		
J.3.	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
J.4	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
J.5A	SCREW HSHC M6-40-8.8 ISO 4762 ZINC PLATE	1	0-10-174-55		
J.5B	WATERPROOF NUT SEAL LOCK M6	1	1-10-751-96		
K...	CLEANING SHOVEL				
K.0.	DRILLED BLOCK 230x145x145	1	1-10-907-53		
K.0.	DISTRIBUTION BLOCK BATH GRAB ASS'Y	1	1-10-918-38		
K.1A	HYD MALE PUSH PULL 1" REF.25FFP100BS143	1	1-10-512-07		
K.1B	PLUG HYD MALE PUSH PULL 1" REF.PDC25FF	1	1-10-513-63		
K.1C	HYD FEM PUSH PULL 1" REF.25FFS100BS143	1	1-10-512-05		
K.1D	PLUG HYD FEM PUSH PULL 1" REF.SDC25FF	1	1-10-513-60		
K.2A	HYD MALE PUSH PULL 1/2" REF.12FFP50BS143	4	1-10-583-22		
K.2B	PLUG HYD MALE PUSH PULL 1/2" REF.PDC12FF	4	1-10-513-61		
K.2C	HYD FEM PUSH PULL 1/2" REF.12FFS50BS143	4	1-10-583-23		
K.2D	PLUG HYD FEM PUSH PULL 1/2" REF.SDC12FF	4	1-10-511-58		
K.3A	VALVE D 4 1V W 034 C 4 V J W	1	1-10-729-94		
K.3B	BENDEDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-03		
K.3C	BENDEDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
K.3D	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
K.4A	VALVE D 4 1V W 034 C 4 V J W	1	1-10-729-94		
K.4B	BENDEDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-03		
K.4C	BENDEDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
K.4D	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
K.5.	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
K.6.	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
K.7.	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
K.8.	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
L...	SHOVEL 1ST LIFTING				
L.0.	HYDRAULIC CYLINDER V80HT ASS'Y	1	1-10-918-00		
L.1.	SECURITY BLOCK BATH GRAB ASS'Y	1	1-10-917-90		
L.2.	VALVE IN CARTRIDGE CACG-LGV	1	1-10-565-31		
L.3.	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
L.4.	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
M...	SHOVEL 2ND LIFTING				
M.0.	HYDRAULIC CYLINDER V80HU ASS'Y	1	1-10-918-03		
M.1.	SECURITY BLOCK BATH GRAB ASS'Y	1	1-10-917-90		
M.2.	VALVE IN CARTRIDGE CACG-LGV	1	1-10-565-31		
M.3.	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		
M.4.	PRESSURE INTAKE SMK20-G1/4-VC	1	0-00-349-33		

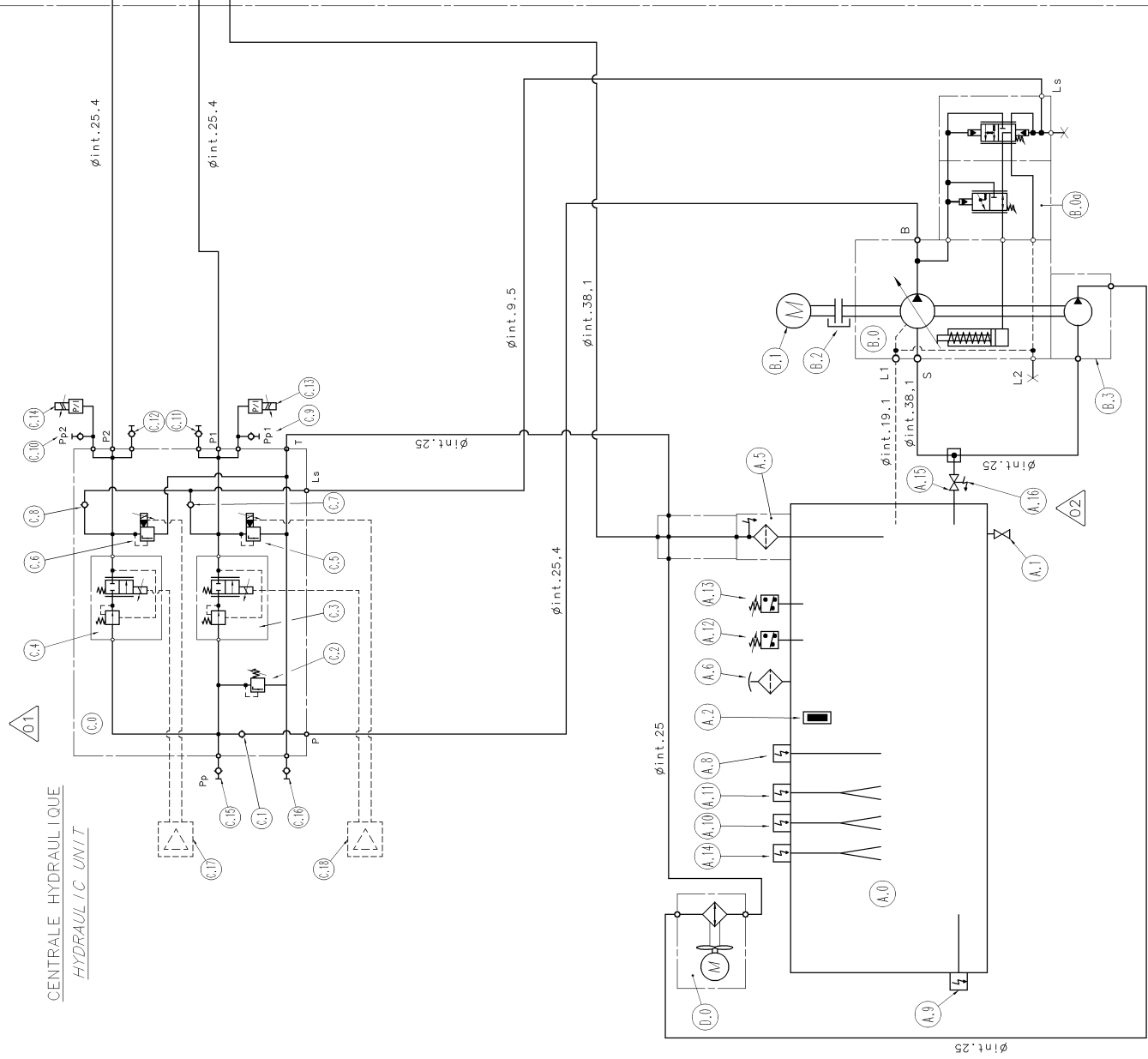




CRUST BREAKER
TILTING



PELLE A DECHETS - 2ème LEVAGE
BATH GRAB - 2de lifting



CENTRALE HYDRAULIQUE
HYDRAULIC UNIT

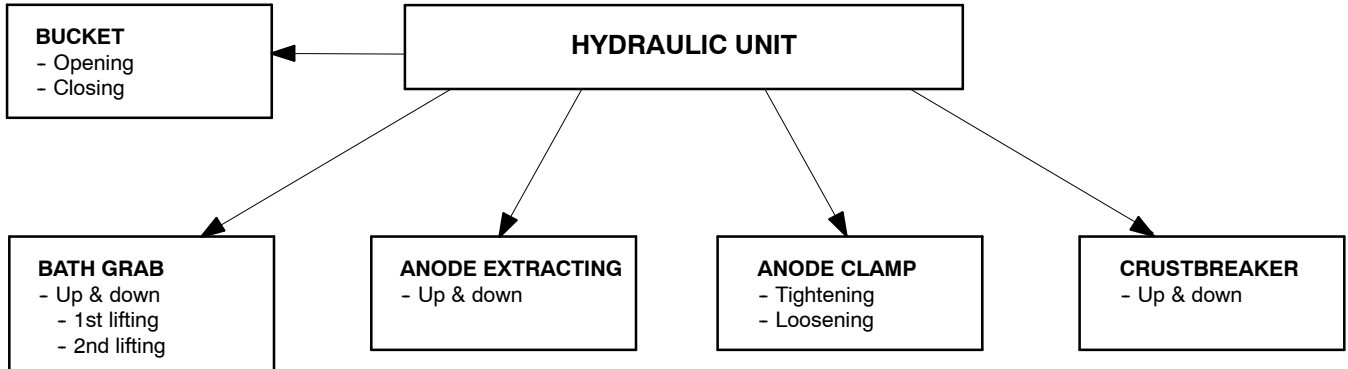
[illegible]

5.3 DESCRIPTION AND OPERATION OF THE HYDRAULIC UNIT

ECL Document reference code : 1-10-954-61 rev.02 (info. Oil used Quintolubric 888-68)

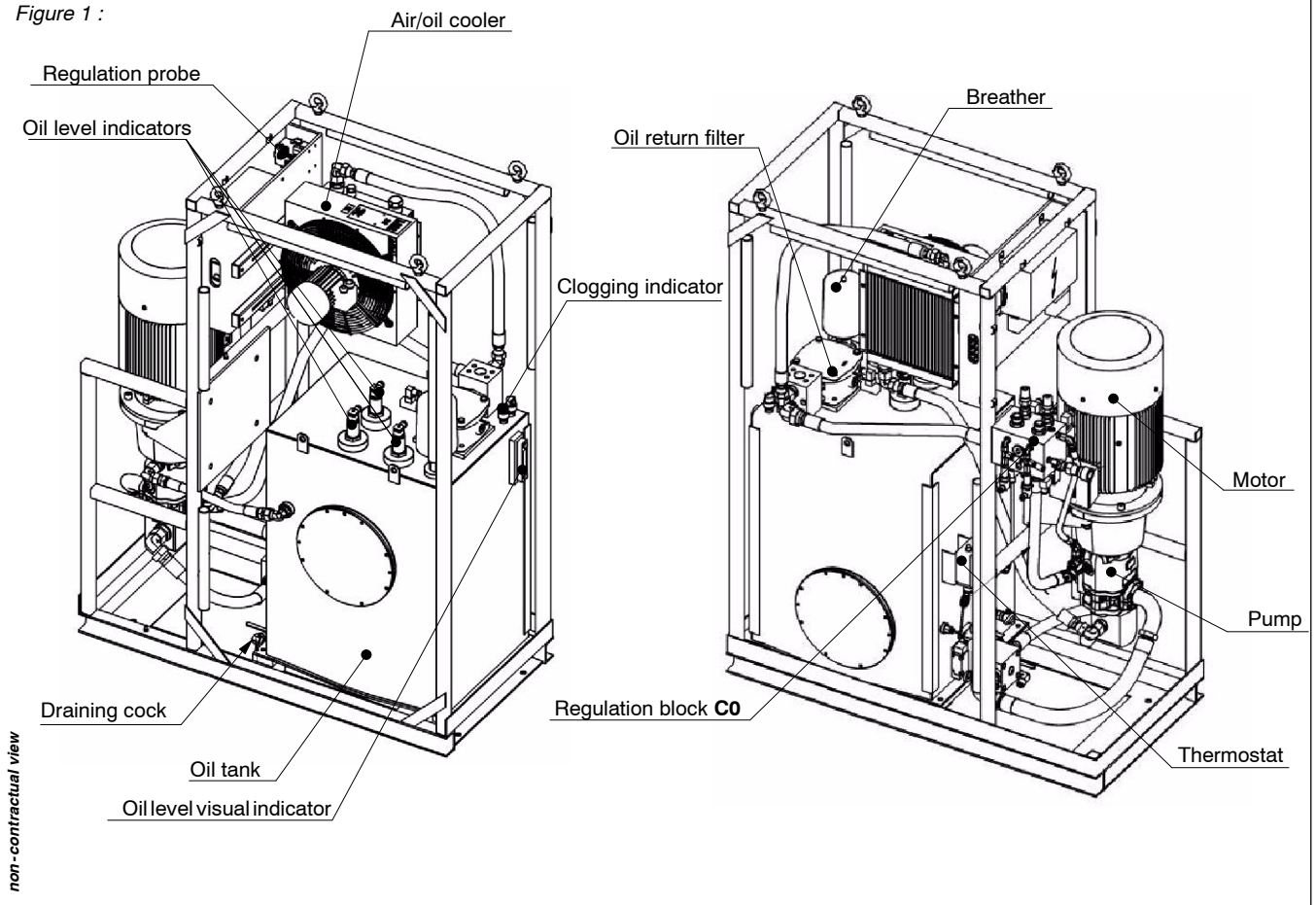
1. PURPOSE AND DESCRIPTION

- The hydraulic unit installed under the tools rotation of the tending trolley allows the hydraulic movements of the following tools and functions



- The hydraulic unit consists of the main following parts :

Figure 1 :



2. DELIVERY CONDITIONS

- The hydraulic unit is separately delivered and will be installed on site.
- The oil tank is delivery without hydraulic oil but with antirust protection by means of "MOTORSTOR" oil. It is not necessary to drain the tank before the first oil filling the "MOTORSTOR" oil can be mixed



WARNING

**Use only the ECL recommended hydraulic fluid.
See CHAPTER 3**

- All orifices and unions have been plugged in ECL workshop to prevents the dust introduction in the hydraulic circuit
- The hydraulic hoses and pipes are delivered without oil and their orifices have been plugged in ECL workshop
- Preadjustments in ECL workshop
- The adjustment of the thermostat, compensators, pressure and flow valves, safety valve, manostat, etc... have been made in ECL workshop in function of the local and working conditions (temperature, oil, receivers)
- Final adjustment on site :
 - The adjustment values tables included in this manual give the flow and pressure set values which have been used to preadjust the unit in ECL workshop
 - These values are given for the hydraulic fluid indicated at the **CHAPTER 3**.
 - On site, adjustments may be required to obtain the cycle and theoretical pressures

3. DELAYING

3.1. ELECTRIC MOTOR (B1)

A time delay system control the stopping of the motor as follows : at the end of a motion, the electric motor will stop within 3 minutes if no other motion is required by the operator.

3.2. MOVEMENTS

- All motions are authorized after the feedback information of the electric motor starting (**B1**).

3.2.1. AFTER ORDER OF STOPPING MOVEMENT GIVEN BY OPERATOR

- **a)** When High Speed,
the movement will be done in low speed, then it will be stopped by the pressure and flow regulation given by operator.
- **b)** When Low Speed,
stop of the movement by the pressure and flow regulation.

3.2.2. AFTER ORDER OF STOPPING MOVEMENT GIVEN BY LIMIT SWITCH

- **a)** When High Speed,
the movement will be done in low speed, then it will be stopped by the pressure and flow regulation after a delay : 0,5 second.
- **b)** When Low Speed,
stop of the movement by the flow and pressure regulation.

3.2.3. HIGH SPEED STARTING UP OF MOVEMENT

Starting up in low speed, then high speed movement 0,5 second after.

3.2.4. REVERSE MOVEMENT

- **a)** When High Speed, the movement will be done in low speed, then it will be stopped by the pressure and flow regulation after a delay : 0,5 second.
Beginning of the reverse movement in low speed then in high speed after a delay of 0,5 second (if the high speed is controlled).
- **b)** When Low Speed, stop of the movement by the flow and pressure regulation.
Beginning of the reverse movement in low speed then in high speed after a delay of 0,5 second (if the high speed is controlled).

4. SAFETY CONDITIONS**4.1. LOW OIL LEVEL**

An alarm in cabin informs the operator, if there is a low oil level detection (**A10**)

All hydraulic functions and pump rotation will be stopped, if the very low oil level is detected by level indicator (**A11**) .

4.2. HIGH OIL LEVEL

An indication is sent to the panel view.

4.3. TANK PRESSURE

The information of filter clogging (**A5**) is activated, if there is a depressurisation in the tank.

An alarm in cabin informs the operator, if a depressurisation in the tank detected by the clogging indicator (**A12**) is activated.

All hydraulic functions and pump rotation will be stopped, if a depressurisation in the tank detected by the clogging indicator (**A13**) is activated.

4.4. MAXI OIL TEMPERATURE

Recommended hydraulic fluid :

- Supplier **QUAKER CHEMICAL**
- Reference **QUINTOLUBRIC 888-68**

All hydraulic functions are stopped by the control thermostat "DANFOSS" item (**A8**).

- Setting of the thermostat (**A8**) = + **95° C**

Note : The precise adjustment of the thermostat must be done with the probe in a heated oil bath and checked by a separator thermometer.

The oil temperature is done by the probe (**A9**)

The Start-up / Stopping of the air/oil exchanger (**D0**) is activated by the probe (**A9**)

5. VARIOUS

Filter (A5) :

- The clogging of the filter (**A5**) is indicated on the panel view in cab

Electric motor (B1) :

- Voltage: 380 / 400 / 415 V – 50 Hz
..... 440 / 460 / 480 V – 60 Hz
- Power: 22 kW
- Speed: 1460 rpm

Proportional solenoid valves (C3 / C4) :

- Voltage: 24 Vdc
- Current : 0,810 Amp

Proportional solenoid valves (C5 / C6) :

- Voltage: 24 Vdc
- Current : 0,660 Amp

Solenoid valves (E1 / E2 / K3 / K4 / G1 / G2) :

- Voltage: 24 Vdc
- Power : 30 W
- Current : 1,25 Amp

6. TECHNICAL DATA OF RECEIVERS

6.1. EXTRACTING MECHANISM

1MAXI theoretical extracting Force : 11 000 daN

including :

Weight of mobil part of the extraction mechanism : 1 500 kg

implying :

Theoretical force : 12 500 – 1 500 = **11 000 daN**

* note : 1 kg = 1 daN

6.2. TIGHTENING MECHANISM

The tightening torque : **340 Nm** is measured by the torquemeter located between the connector and the tightening wrench.

The tightening torque is very important, it is obtained by adjustment of the pressure controller DSA (**B0a**)

7. SIMULTANEOUS FUNCTIONS

The 1st lifting of the bath grab (shovel) can be simultaneous with the 2nd lifting of the bath grab.

The lowering of the crust breaker can be simultaneous with the crust breaker tilting.

8. SECURITY OF THE PUMP SUCTION VALVE

Electrical limit switch (A.16) mounted on the suction circuit valve (A.15) of the pumps (B.0 & B.3) :

- No movement allowed if limit switch (A.16) is released (Immediately stop of the engine B.1)
- In usual operation : The limit switch (A.16) is activated and movement is authorized.

9. NOTA

The pressure and flow values are given for the machine adjusting.

Some adjustments could be necessary to obtain the theoretical cycles and stresses

The flow values are given for oil acceptable mini viscosity : **12 Cst at T = + 90 °C**

Those values can change according to oil viscosity.

10. CORRESPONDENCE BETWEEN HYDRAULIC & ELECTRIC MARKS

Functions	Hydraulic Marks	Electric Marks
Clogged filter	A.5	HU-PS-01
High temperature	A.8	HU-TSH-01
Regulation temperature probe	A.9	HU-TW-01
Low oil level	A.10	HU-LSL-01
Very low oil level	A.11	HU_LSL-02
Clogging indicator clogged	A.12	HU_PS-02
Clogging indicator very clogged	A.13	HU_PS-03
High oil level	A.14	HU-LSH-01
Limit switch suction valve	A.16	HU-ZS-01
Electric motor of the motopump group	B.1	HU-M51
Electro proportional flow	C.3	HU-XV-01
Electro proportional flow	C.4	HU-XV-03
Electro proportional pressure	C.5	HU-XV-02
Electro proportional pressure	C.6	HU-XV-04
Analogic pressure detector	C.13	HU-PT-01
Analogic pressure detector	C.14	HU-PT-02
Flow / Pressure card	C.17	AE03
Flow / Pressure card	C.18	AE09
Air / Oil exchanger	D.0	HU-M52
Lowering crustbreaking	E.1a	BK-XV-01
Lifting crustbreaking	E.1b	BK-XV-02
Lifting crustbreaker	E.2a	BK-XV-03
Tilting crustbreaker	E.2b	BK-XV-04
Crust breaker bottom retaining valve	E.11b	BK-XV-06
Lowering extracting	G.1a	EX1-XV-02
Lifting extracting	G.1b	EX1-XV-01
Tightening	G.2a	EX1-XV-05
Untightening	G.2b	EX1-XV-04
Lowering shovel (1st lifting)	K.3a	SH-XV-01
Lifting shovel (1st lifting)	K.3b	SH-XV-02
Lowering shovel (2nd lifting)	K.4a	SH-XV-03
Lifting shovel (2nd lifting)	K.4b	SH-XV-04

5.4 METHOD FOR ADJUSTING UNIT AND HYDRAULIC FUNCTIONS

ECL Document reference code : 1-10-954-61 rev.02 (info. Oil used Quintolubric 888-68)

**METHOD FOR ADJUSTING A HYDRAULIC UNIT
WITH VARIABLE FLOW PUMPS,
COMPENSATORS, PRESSURE LIMITER
AND PROPORTIONNAL FLOW / PRESURE VALVES**

WARNING

This method is designed to carry out the complete adjustment of the hydraulic system of the machine, there is a logical order between the different phases of adjustment.

In the event of action being taken, only part of the adjustment can be repeated, however, you must make sure that the previous phases are correct and check the phases coming after the action.

Adjustments of the motor and pump units are a great deal easier when the following is used :

- A hydraulic by-pass circuit including a flow transducer and a discharge valve.
- The " PARKER " sensor control kit with SCQ flow transducer, two pressure temperature sensors SCPT and the hand hold measuring instrument SCM.
- These equipment code : **1-10-092-65** are described in the chapter "Kit for measure and adjustments of the hydraulic unit"

The following documents must be consulted to carry out the adjustment procedure :

- Hydraulic diagram and the relating parts list.
- Table of theoretical adjustment values.

1. PRELIMINARY CHECKS

1.1. BASIC CHECK

After filling with oil, delay any adjustment by approximately 10 hours to allow the oil to be degassed.

Check :

- Oil level (Maxi level on the visual indicator).
- Oil temperature > 20°C.
- The electrical supply of 24 V = on the solenoid valves

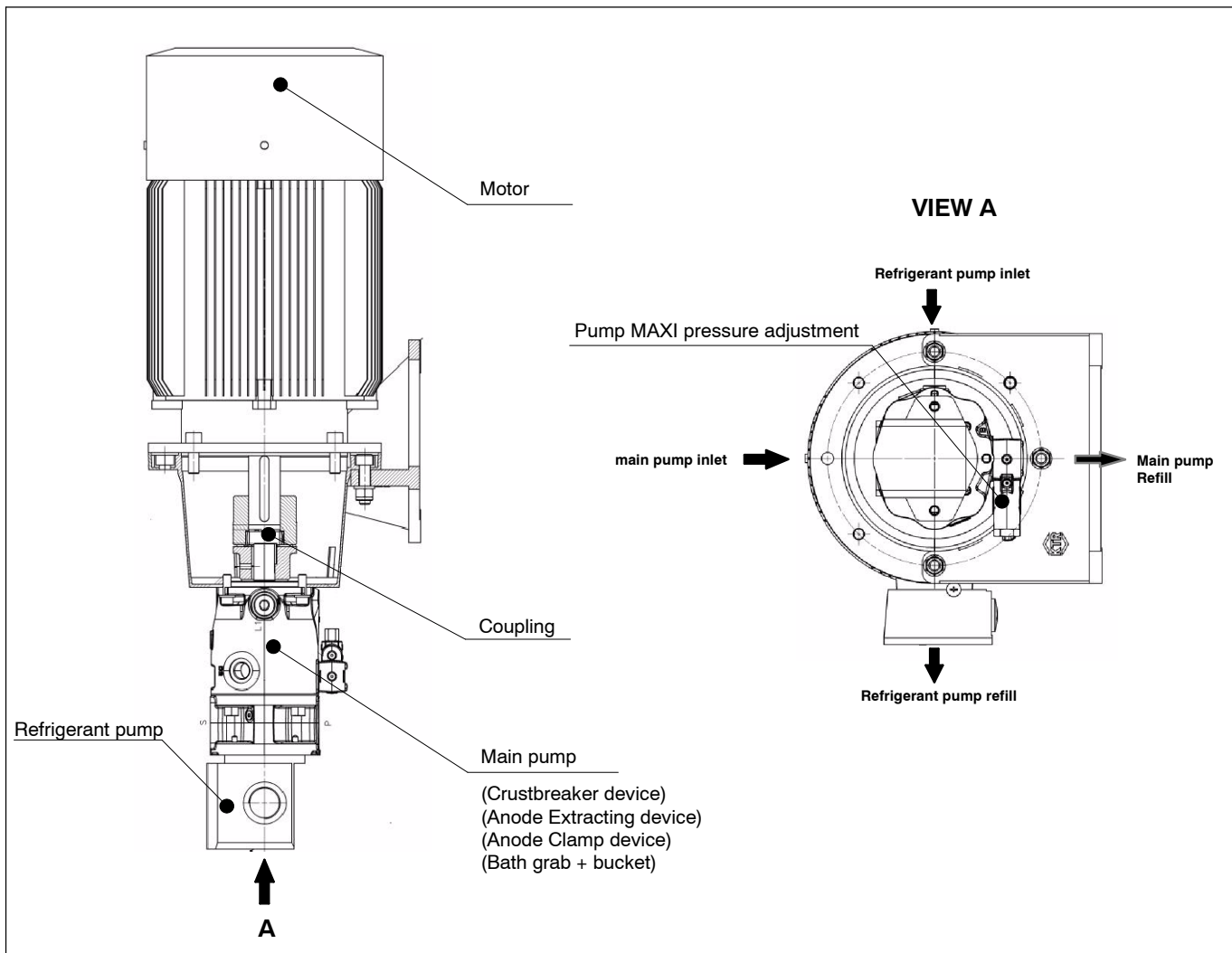
1.2. INSTALL THE BY-PASS CIRCUIT

Install the by-pass circuit as showed in the diagram describe in the chapter "*Kit for measure and adjustments of the hydraulic unit*".

(Pressure limiter VPR and Flow controller SCQ)

Connect a pressure gauge (0 to 80 bars) or a pressure sensor on the pressure plug **Pp1** and **Pp2** (P).

1.3. PUMP MOTOR UNITS DESCRIPTION



2. ADJUSTMENTS OF PUMPS

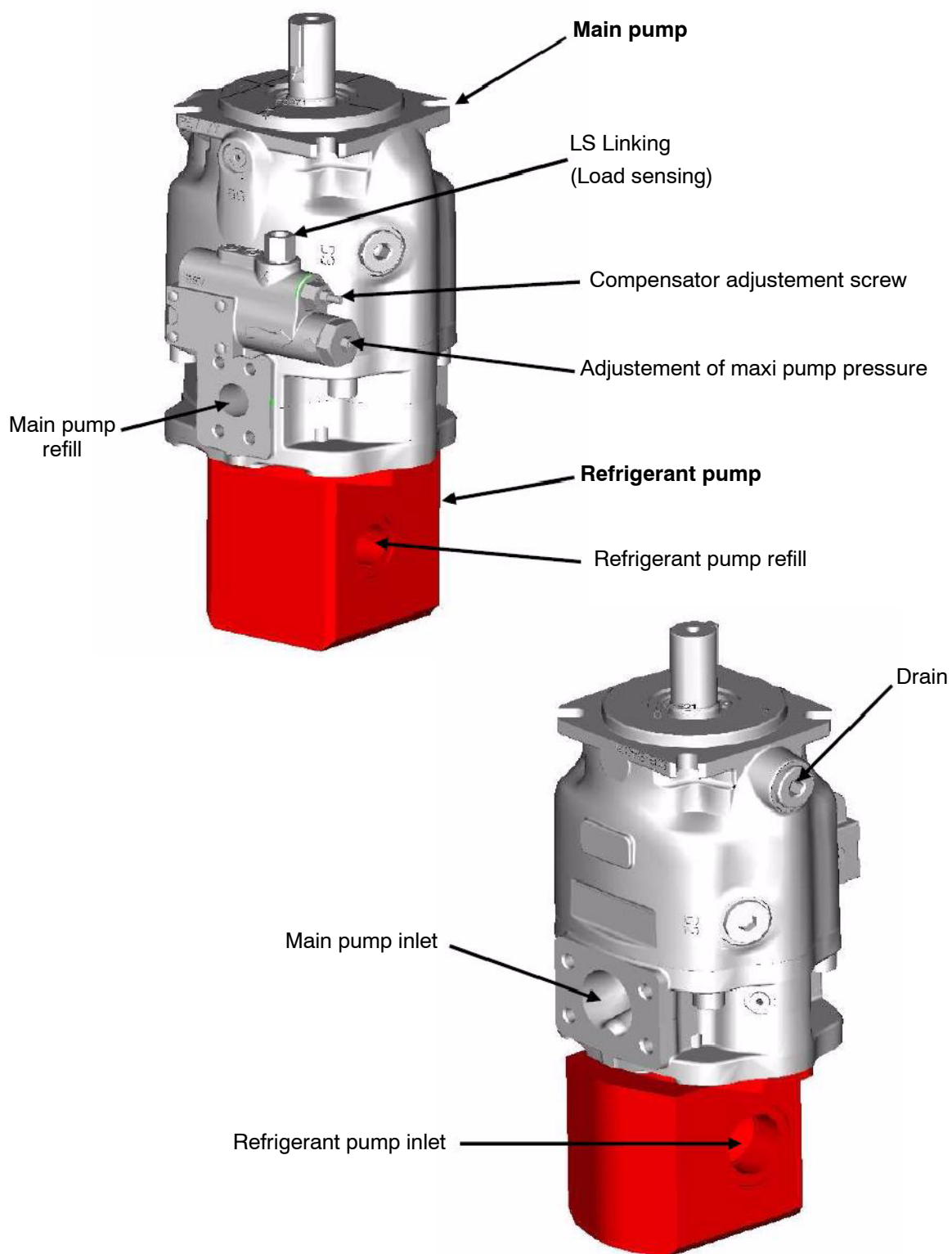
2.1. INITIAL STARTING CONDITIONS

- After the oil filling, wait the oil degassing (10 hours) before to proceed at the adjustment.
- Check the oil tank level.
- Check the oil temperature.
- Connect the by-pass circuit (pressure limiter and flowmeter) on the pump between **C11** (or **C12**) & **C16**.
- Connect manometers (0-80 bars) or pressure sensors to the pressure intakes **Pp** & **Pp1** (or **Pp2**).
- Ensure that the cock of the inlet piping is opened and that the "drain" pipe is correctly connected.
- Loosen thoroughly the safety valve on each regulation block.
- Open thoroughly the pressure limiter of the by-pass circuit.
- Choose one simple motion (non simultaneous movement), and unplug the coils of the concerning valve.

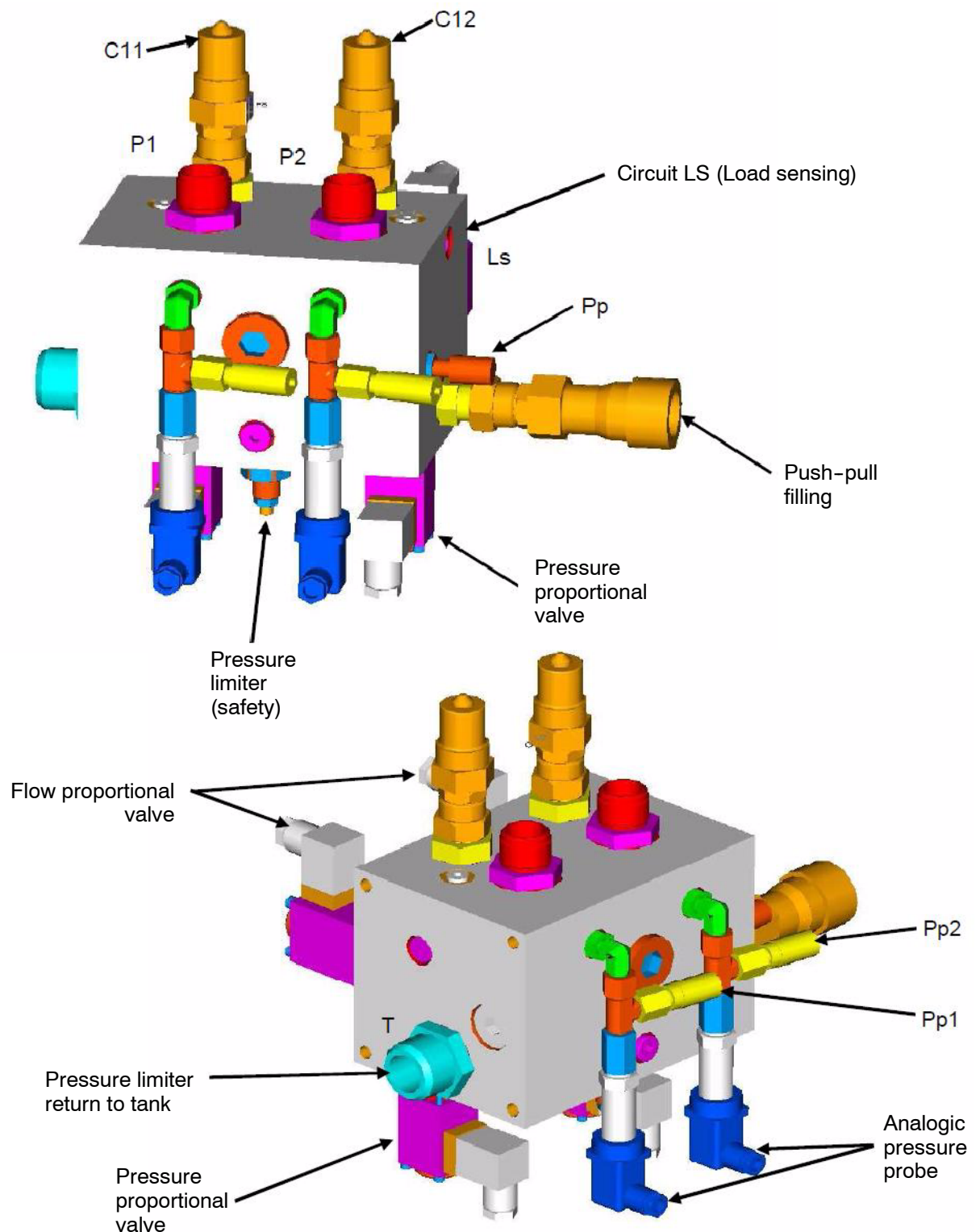
After these operation, the initial starting conditions are done.

2.2. PUMPS STARTING CONDITIONS

- Check the initial starting conditions are correct (see paragraph 2.1).
- Proceed to the safety valve taring, approximately 2/3 of the maximum taring of this one.
- Set the I_{max} value of the pressure proportional valve to 660 mA (to obtain a cancellation pressure to 350 bars for a setpoint fixed to 10 volts).
- Set the pressure setpoint of the chosen movement to obtain a cancellation pressure of approximately 150 bars (approximately 4 volts).
- Set the flow setpoint of this movement to 1/2 flow to avoid the cavitation of the pump when it starts up (approximately 6 volts).
- Check the opening of the by-pass circuit pressure limiter.
- Control the chosen movement to :
 - Check the pump rotation direction by short impulses of motor control.
 - Prime the pump by pulses of approximatively 2 seconds.
 - Let the pump running 10 minutes to drain the circuit (by-pass opened).
 - Let the pump running 10 minutes again, with the pressure limiter of the by-pass circuit adjusted to obtain a pressure of 40 bars approximatively for the circuit draining. To obtain this pressure, tighten the safety valve screw of the pump until the valve no longer allows the passage of oil.
- Open thoroughly the by-pass circuit.
- Fix all setpoints to 0 V.

2.3. DESCRIPTION OF HYDRAULIC PUMP AND REGULATION BLOCK**a) Pump**

b) Regulation block



essure limiter return to tank

2.4. CHECK OF THE COMPENSATORS ADJUSTMENT

- Check the initial starting conditions are correct (see paragraph 2.1).
- Check that pump starting conditions are correct (see paragraph 2.2).
- Check the opening of the by-pass circuit pressure limiter.
- Adjust the pressure limiter of the by-pass circuit until a pressure of 50 bars read in **Pp1** (or **Pp2**).
- Adjust the flow setpoint to obtain a flow equal to the 30 l/mn.
- Eventually, readapt the pressure to 50 bars.
- Check the pressure at the output of the pump (**Pp**), this value should be approximative = 70 Bars \pm 2 bars). So we have a $\Delta P = 20$ bars (\pm 2 bars).
- If not, adjust the Δ with the compensator adjustment screw (see figure paragraph 2-3a).
- Open thoroughly the pressure limiter of the by-pass circuit.

2.5. SAFETY VALVE ADJUSTMENT

- **After the previous conditions are done :**
 - Check the opening of the pressure limiter of the by-pass circuit.
 - Use a clamp ammeter to measure the current of electric motor.
 - Tighten the screw of the pressure limiter (safety) on the regulation block at maximum.
 - Tighten the screw of the pressure limiter on the pump at maximum.
 - Connect manometer or a pressure sensor (300 bars) to the pressure intake **Pp**.
 - Adjust the flow setpoint to obtain 15 l/mn (App. 3 volt).
 - Adjust the pressure setpoint to 4 volt to obtain a pressure = 150 bars.
 - Tighten gradually the pressure limiter of the by-pass circuit until thoroughly closing.
 - Read the value of the current motor (**Imot**).
 - Adjust the pressure setpoint to read in **Pp1** (or **Pp2**) a pressure 10 bars over the safety valve prescribed pressure.
 - Untighten progressively the pressure limiter of the regulation block until an increasing of the current motor, what involves a light decrease of the pressure : so the opening point is checked.
 - Open thoroughly the pressure limiter of the by-pass circuit.
- **Checking of the safety valve opening point :**
 - Check that the pressure limiter of the by-pass circuit is open.
 - Check the flow of 15 l/mn.
 - Adjust the pressure setpoint to 10 volt to obtain a cancellation pressure up to the safety valve pressure value.
 - Tighten progressively the pressure limiter of the by-pass circuit until the opening of the safety valve (opening point).
 - Check the pressure when the flow start to decrease.
 - Tighten the locknut of the safety valve screw.
 - Open thoroughly the pressure limiter of the by-pass circuit.

2.6. PRESSURE PROPORTIONAL VALVE & ITS CONTROL CARD ADJUSTMENT

- Assemble the by-pass circuit (Pressure limiter & flowmeter) on the circuit to be adjust between **C11** (or **C12**) and **C16**.
- Install a manometer or pressure probe (300bars) on pressure intake **Pp1** (or **Pp2**).
- Start the motopump group.
- Connect the Computer to the card, start the software and begin the communication with card.
- Adjust the setpoint to app. 5 l/mn on the circuit flow proportional valve **P1** (or **P2**).
- Adjust the setpoint to 0 volt on the circuit pressure proportional valve **P1** (or **P2**).
- Close the valve of the by-pass circuit (it is not necessary to close it thoroughly).
- Adjust the current value **I mini** to obtain a pressure = 20 bars on the circuit **P1** (or **P2**).
- Open thoroughly the pressure limiter of the by-pass circuit.
- Set the value of **I max** to **500 mA**.
- Adjust the setpoint to 10 volt on circuit pressure proportional valve **P1** (or **P2**).
- Tighten progressively the limiter of the by-pass circuit until its thoroughly closing.
- Adjust the **I max** set value to obtain a pressure = 250 bar (read on **Pp1** (or **Pp2**)).
- Open thoroughly the pressure limiter of the by-pass circuit.

2.7. FLOW PROPORTIONAL VALVE & ITS CONTROL CARD ADJUSTMENT

- Assemble the by-pass circuit (Pressure limiter & flowmeter) on the circuit to be adjust between **C11** (or **C12**) and **C16**.
- Connect the Computer to the card, start the software and begin the communication with card.
- Set the setpoint of the pressure proportional valve to app. 100bar on **P1** (or **P2**).
- Adjust the setpoint to 0,1 volt of the flow proportional valve on **P1** (or **P2**).
- Adjust the current value **I mini** to obtain **2 l/mn**.
- Adjust the setpoint of the flow proportional valve to 10 volts on **P1** (or **P2**).
- Adjust the current value **I maxi** to obtain **65l/mn**.
- Power down the proportional valves.
- Check the thoroughly opening of the by-pass circuit.

2.8. ADJUSTMENT OF THE PRESSURE LIMITER ON PUMP

- Check the thoroughly opening of the by-pass circuit.
- Adjust the setpoint to 10 volts on the pressure proportional valve.
- Adjust the setpoint to 3 volts on the flow proportional valve.
- Tighten gradually the pressure limiter of the by-pass circuit until its thoroughly closing.
- Unscrew the pressure limiter of the pump until the desired adjustment value (see chapter *Table of theoretical values* paragraph "Starting up").
- Open thoroughly the pressure limiter of the by-pass circuit.

2.9. REMARK

The order of the settings must be respected. During these adjustments, ensure there are no anomalies (pressure, noise,.....). In case of problems, start again the adjustments from the beginning.

2.10. FLOW AND PRESSURE SETPOINT ADJUSTMENTS FOR EACH FUNCTION

- Check the opening of pressure limiter of the by-pass circuit.
- Disconnect the sockets (coils) of the concerned solenoid valve.
- Adjust all flow setpoints at 0 Volt
- Adjust all the pressure setpoints to 4 volts maxi.

2.10.1. FLOW ADJUSTMENT FOR EACH FUNCTION

(This procedure is good for all functions)

- Control manually the movement.
- Adjust the flow setpoint to obtain the required flow.
- Adjust the pressure limiter of the by-pass circuit until to read 40 bars in **Pp2**.
- Adjust the flow setpoint to obtain the required flow with 40 bars in **Pp2**.

2.10.2. PRESSURE ADJUSTMENT FOR EACH FUNCTION

(This procedure is OK for all other functions)

- Close the pressure limiter of the by-pass circuit.
- Control manually the movement.
- Adjust the pressure setpoint to obtain the required pressure.

2.10.3. NOTA

The adjustment of the flow and pressure set values is made by INCREASING value.

5.5 TABLE OF THEORETICAL ADJUSTMENT VALUES

ECL Document reference code : 1-10-954-61 rev.02 (info. Oil used Quintolubric 888-68)

**WARNING**

- The hydraulic unit have been preadjusted in ECL workshop before expedition on site, these preadjustments (flow and pressure compensators, safety valve, manostat, valves ...) have been done in function of the local and working conditions (temperature, oil, receivers) consequently final adjustments will be required on site to reach the pressures and speeds.
- The final adjustments on site will be done using the ECL recommended oil (See chapter "List of recommended lubricant" of this manual) and referring to the set values included in the table hereafter.
- The values included in these tables are those which have been used to preadjust the unit in ECL workshop, these values are given for a mini oil viscosity of **12 Cst** at **+90° C**, they change in function of the oil viscosity , these values are theoretical and if necessary will have to be modified on site to obtain the required flows and pressures.

1. STARTING UP**WARNING**

The values of temperature are available with ECL recommended hydraulic fluid.
See Chapter "List of recommended lubricant"

* 0 0C		Functions of hydraulic unit					
		Out of order	Stand by	In order	In order with E.C.L recommended hydraulic fluid		
Description	Item				T = + 45° C	T = + 40° C	T = + 95° C
Filter clogged	A.5		0	0			
Electric contact low level	A.10		0	0			
Electric contact very low level	A.11		0	0			
Electric contact high level	A.14		0	0			
Breather clogged	A.12		0	0			
Breather very clogged	A.13		0	0			
Temperature adjustment	A.9		0	0	0	0C	
Thermometer T = + 95° C	A.8						0C
Electric motor	B.1		0	0	0	0	
Air / oil exchanger	D.0				0		

Constants	Item	SETTING TABLE		
		Pressure		
		Bar	P.S.I	Reading Ref.
Safety valves	C.2	260	3 770	Pp
Pressure limiter on pump	B.0a	240	3 480	Pp

NOTE : Temperature informations are available with hydraulic fluid type : See *List of recommended lubricant*

2. EXTRACTING

* = Hyd. activity 0 = Elec. activity OT = Timer + = Rod out - = Rod In H.S. ... = High speed L.S. ... = Low speed	COMPONENT ACTION													
	Movement S.V.			Flow S.V.		Pressure S.V.		Manostat See NOTA		Retaining valve		Limit switch		
Function ↓ Rep →	G.1a	G.1b		C.3		C.5		C.13		J.2		Slow	Stop	
Down H.S. +	OT			0		OT				*		Encoder		
Down L.S. +	0			0		0				*			Encoder	
UP H.S. -		OT		0		OT		0				Encoder		
UP L.S. -		0		0		0		0					Encoder	
UP extracting F = 11T		0		0		0		0						
UP L.S. - Gap correction		0		0		0		0						

	SETTING VALUES										
	Speed		Flow E.V C.3			Pressure S.V. C.5				Ramp	
Function ↓ Unit →	M/min	Mm/sec	L/mn		Value in Volt	Bar	PSI	Reading ref.	Values in volt	↗ s.	↘ s.
Down H.S. +	20	333	49		7,4	40	580	Pp1	1,7		
Down L.S. +	1,6	27	4		0,4	40	580	Pp1	1,7		
UP H.S. -	12	200	65		10	130	1885	Pp1	5,6		
UP L.S. -	1,5	25	8		1,25	130	1885	Pp1	5,6		
UP extracting F = 11T	1,5	25	8		1,25	220	3190	Pp1	8,7		
UP L.S. - Gap correction	1,5	25	8		1,25	40	580	Pp1	1,7		
Low speed max +	6	100	14,8		2,2	40	580	Pp1	1,7		
Low speed max -	6	100	32,3		5	130	1885	Pp1	5,6		
Constant											
Retaining valve J.2						100	1450	J.3			
Value 1 C.13						130	1885	Pp1			
Value 2 C.13						40	580	Pp1			

NOTE 1 :

The high or low speed movement to the extracting function transition is given by the value 1 of the pressure probe (C.13) (elect item **HU-PT-01**)

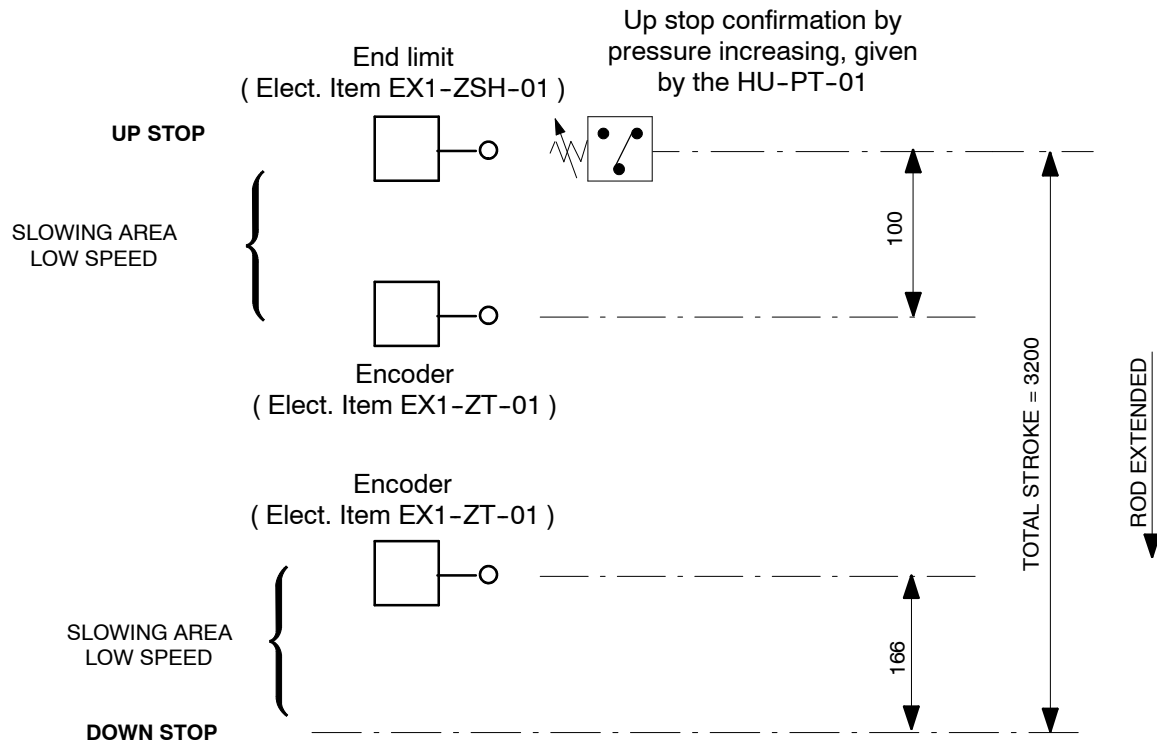
NOTE 2 :

In up motion, the gap correction information (at starting up) is given by value 2 of the pressure probe (C.13) (elect item **HU_PT-01**)

NOTE 3 :

The low speed is the max speed allowed when a encoder anomaly is detected.

SCHEMATIC VIEW OF EXTRACTION STROKE FUNCTIONS.



NOTE :

The slowing down induced by the encoder (**EX1-ZT-01**) must not prevent the high speed starting up in reverse movement.

The end limit (**EX1-ZSH-01**) on **UP STOP** check the encoder operating and correct tool positioning.

The cylinder stop is also detected by a pressure increasing given by the analogic pressure probe (**HU-PT-01**)

3. CONNECTORS TIGHTENING

* = Hyd. activity 0 = Elec. activity OT = Timer + = Rod out - = Rod In H.S. ... = High speed L.S. ... = Low speed		COMPONENTS ACTION											
		Movement S.V.			Flow S.V.			Pressure S.V.					
Function ↓	Reference →	G.2a	G.2b		C.3			C.5					
Untightening			OT		0			OT					
Tightening		OT			0			OT					

		SETTING VALUES									
		Speed		Flow S.V. C.3		Pressure S.V. C.5					
Function ↓	Unit →	rpm		l/mn	volt (for information)	Bar	P.S.I	Reading ref.	volt (for information)		
Left tightening		76.8		24	3.85	90	1305	Pp1	4		
Right tightening		76.8		24	3.85	90	1305	Pp1	4		
Constant											
Pressure limiter	G.3					90	1305	G.6 & G.7			

NOTA :

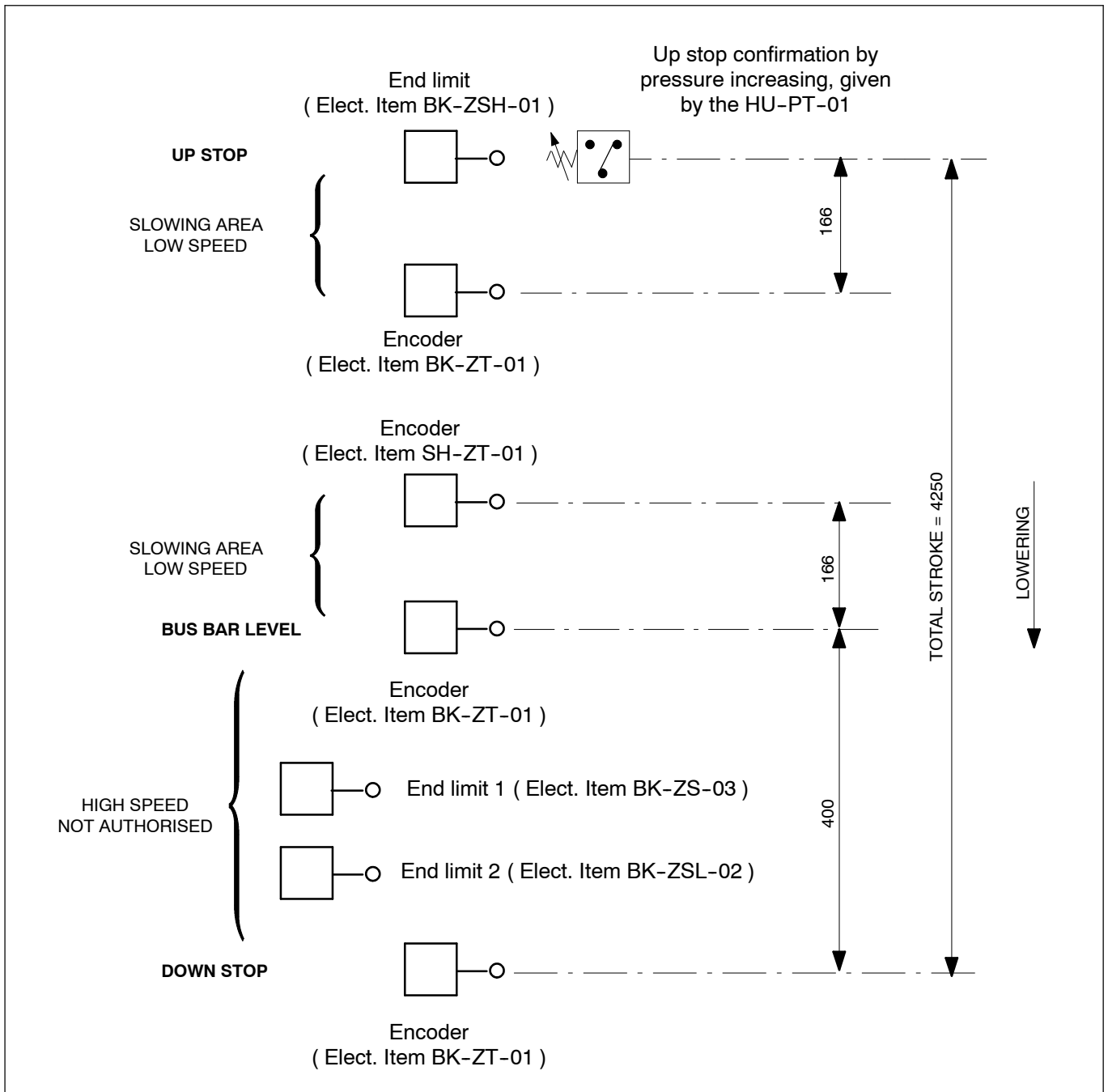
The tightening torque : **34 m/daN** is measured by the E.C.L. torquemeter located between the connector and the tightening wrench.

The tightening torque is very important, it is obtained by adjustment of the proportional pressure valve **C.5**.

4. CRUST BREAKER LOWERING

* = Hyd. activity 0 = Elec. activity OT = Timer + = Rod out - = Rod In H.S. ... = High speed L.S. ... = Low speed	COMPONENTS ACTION												
	Movement S.V.			Flow S.V.			Pressure S.V.			Retaining valve		Limit switch	
Function ↓ Reference →	E.1a	E.1b	E.11	C.3			C.5			F.3		Slow	Stop
Down H.S. +	OT			0			OT			*		encoder	
Down slowing and L.S. +	0			0			0			*			encoder
UP H.S. -		OT	0	0			OT					encoder	
UP slowing and L.S. -		0	0	0			0						encoder

	SETTING VALUES									
	Speed		Flow S.V. C.3		Pressure S.V. C.5				Ramp	
Function ↓ Unit →	m/mn	mm/s	l/mn	Volt (for information)	Bar	P.S.I	Reading ref.	Volt (for information)	↗ in s	↘ in s
Down H.S. +	20	333	49	7,4	30	435	Pp1	1		
Down slowing and L.S. +	1,5	25	4	0,4	30	435	Pp1	1		
UP H.S. -	20	333	51	7,5	150	2175	Pp1	6,25		
UP slowing and L.S. -	1,5	25	4	0,4	150	2175	Pp1	6,25		
Low speed max +	6	100	15	2,2	30	435	Pp1	1		
Low speed max -	6	100	15	2,2	150	2175	Pp1	6,25		
Constant										
Retaining valve F.2					90	1305	F.3			
Pressure limiter E.12					10	145	F.4			

SCHEMATIC VIEW OF CRUSTBREAKER LIFTING STROKE FUNCTIONS.

NOTE : The slowing down induced by the encoder (**BK-ZT-01**) must not prevent the high speed starting up in reverse movement .

The end limit (Elect. Item **BK-ZSH-01**) on UP STOP check the encoder operating and correct tool positioning.

The cylinder stop is also detect by a pressure increasing given by the analogic pressure probe (**HU-PT-01**)

The end limits 1 & 2 detects the position of the connecting rod support of the pneumatic crustbreaker

The end limit 1 (Elect. Item **BK-ZS-03**) authorise the pneumatic breaking (breaker tip in position)

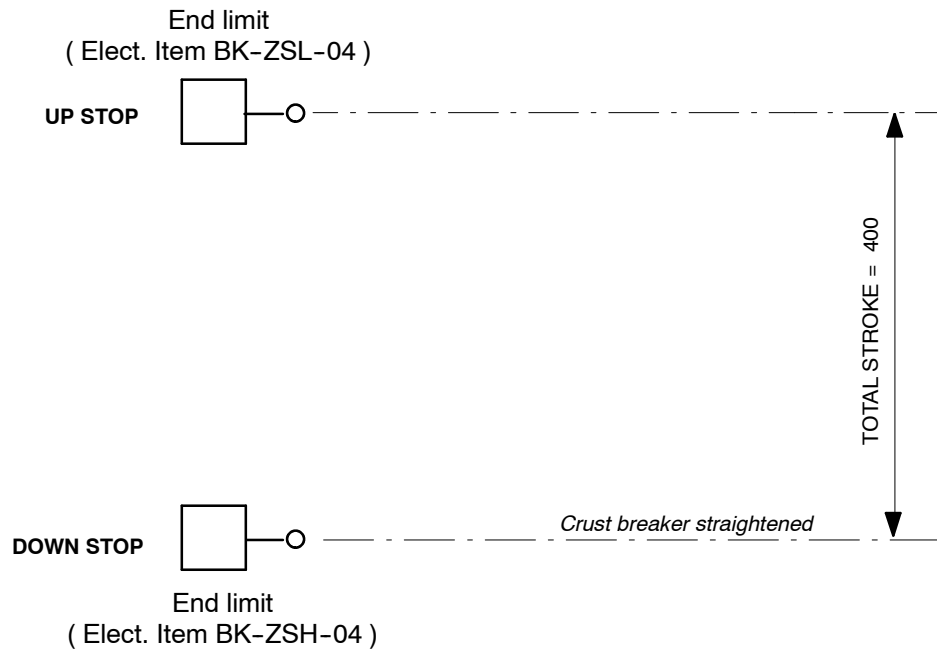
The end limit 2 (Elect. Item **BK-ZSL-02**) stop and forbid the lowering of the breaker

5. CRUST BREAKER TILTING

* = Hyd. activity 0 = Elec. activity OT = Timer + = Rod out - = Rod In H.S. ... = High speed L.S. ... = Low speed	COMPONENTS ACTION													
	Movement S.V.				Flow S.V.		Pressure S.V.			Retaining valve		Limit switch		
Function ↓ Reference →	E.2a	E.2b			C.4		B.0a			I.2	I.3	Slow	Stop	
Tilting L.S. +		OT			0		OT				*	BK-ZSL-04		
Tilting L.S. -	OT				0		OT			*		BK-ZSH-04		

		SETTING VALUES									
		Speed		Flow S.V. C4		Pressure S.V. B.0a				Ramp	
Function ↓	Unit →	m/mn	mm/s	l/mn	Volt (for information)	Bar	P.S.I	Reading ref.	Volt (for information)	↗ in s	↘ in s
Tilting L.S. +		4,8	80	12	2	60	870	Pp2	2,5		
Tilting L.S. -		5	83	13	2,1	120	1740	Pp2	5		
Constant											
Retaining valve	I.2					150	2175	I.4			
Retaining valve	I.3					160	2320	I.5			

SCHEMATIC VIEW OF CRUST BREAKER TILTING STROKE FUNCTIONS.



6. SHOVEL 1ST LIFTING

* = Hyd. activity 0 = Elec. activity OT = Timer + = Rod out - = Rod In H.S. ... = High speed L.S. ... = Low speed	COMPONENTS ACTION											
	Movement S.V.			Flow S.V.		Pressure S.V.		Pressure probe see NOTA	Retaining valve		Limit switch	
Function ↓ Reference →	K.3a	K.3b		C.3		C.5		C.13	L.2		Slow	Stop
Down H.S. +	OT			0		OT		0	*		encoder	
Down L.S. +	0			0		0		0	*		HU-PT-01	
UP H.S. -		OT		0		OT					encoder	
UP L.S. -		0		0		0						encoder

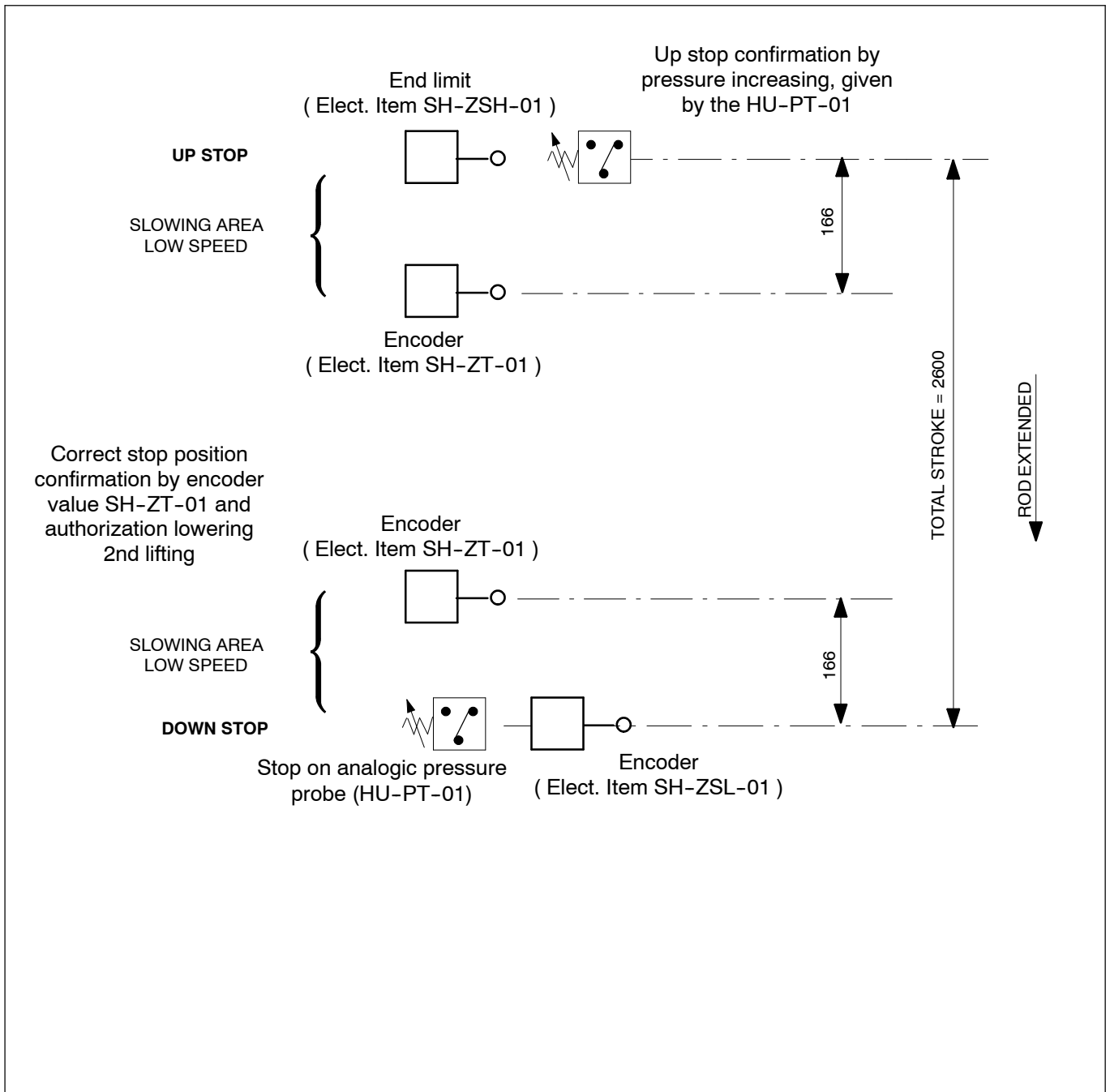
	SETTING VALUES									
	Speed		Flow S.V. C3		Pressure S.V. C.5				Ramp	
Function ↓ Unit →	m/mn	mm/s	l/mn	Volt (for information)	Bar	P.S.I	Reading ref.	Volt (for information)	↗ in s	↘ in s
Down H.S. +	20	333	49	7,4	30	435	Pp1	1		
Down L.S. +	1,5	25	4	0,4	30	435	Pp1	1		
UP H.S. -	20	333	51	7,5	220	3190	Pp1	8,7		
UP L.S. -	1,5	25	4	0,4	220	3190	Pp1	8,7		
Low speed max +	6	100	15	2,2	30	435	Pp1	1		
Low speed max -	6	100	15	2,2	220	3190	Pp1	8,7		
Constant										
Retaining valve L..2					180	2610	L.3			
Pressure probe C.13					30	435	Pp2			

NOTE 1 :

The pressure probe (**C.13**) (elect item **HU-PT-01**) gives the order of 1st lowering end (shovel on mechanical stop) and authorise the 2nd lowering.

NOTE 2 :

The low speed is the max speed allowed when a encoder anomaly is detected.

SCHEMATIC VIEW OF SHOVEL 1st LIFTING STROKE FUNCTIONS.

NOTE : The slowing down induced by the encoder (**SH-ZT-01**) must not prevent the high speed starting up in reverse movement .

The end limit (Elect. Item **SH-ZSH-01**) on UP STOP check the encoder operating and correct tool positioning.

The cylinder stop is also detected by a pressure increasing given by the analogic pressure probe (**HU-PT-01**)

7. SHOVEL 2ND LIFTING

* = Hyd. activity 0 = Elec. activity OT = Timer + = Rod out - = Rod In H.S. ... = High speed L.S. ... = Low speed	COMPONENTS ACTION													
	Movement S.V.				Flow S.V.		Pressure S.V.		Pressure probe		Retaining valve		Limit switch	
Function ↓ Reference →	K.4a	K.4b	M.2a	M.3a	C.4		C.6		C.14	M.6		Slow	Stop	
Down H.S. +	OT				0		OT		0	*				
Down L.S. +	0				0		0		0	*				
UP H.S. -		OT			0		OT		0					
UP L.S. -		0			0		0		0					

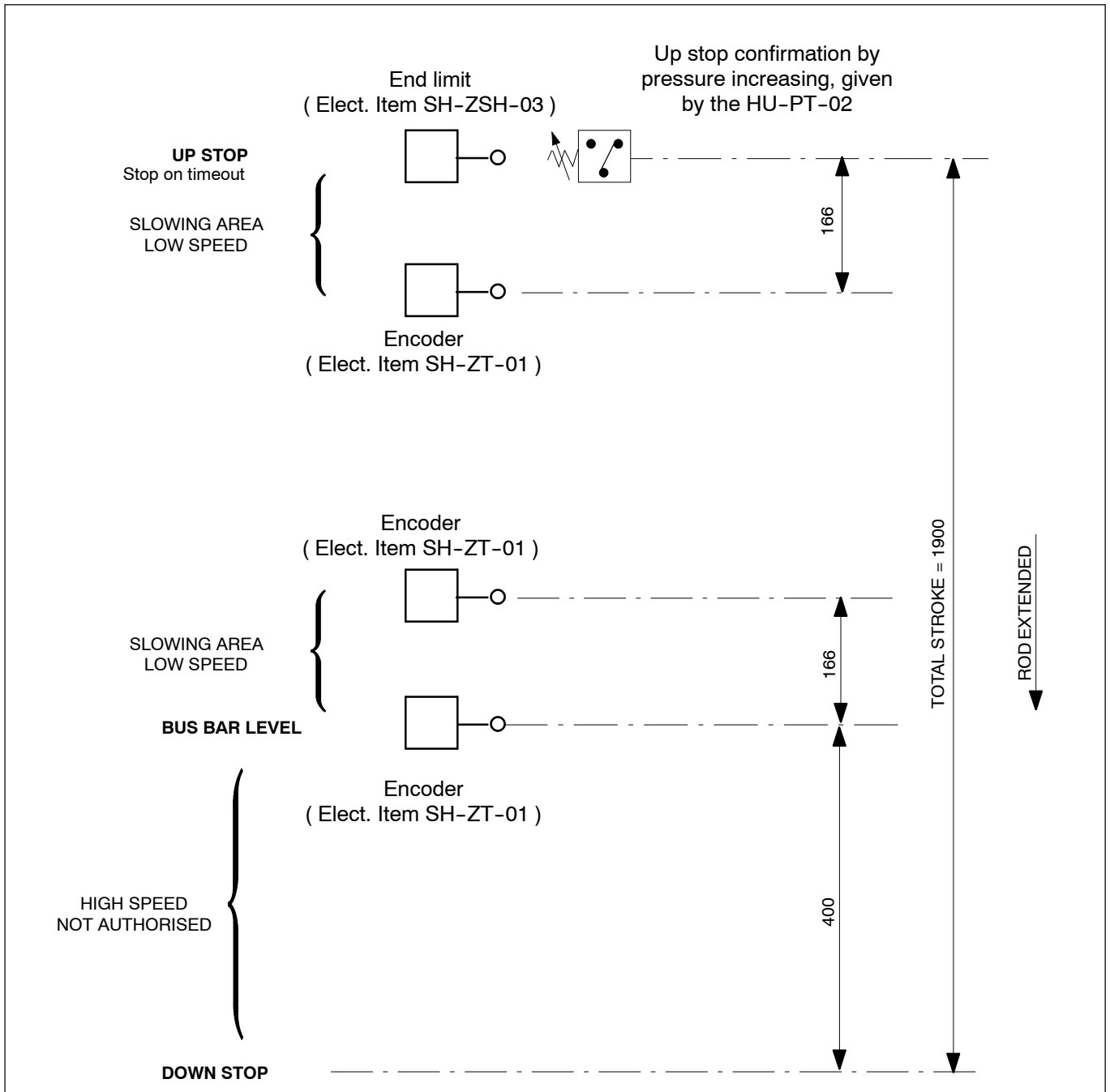
	SETTING VALUES									
	Speed		Flow S.V. C4		Pressure S.V. C.6				Ramp	
Function ↓ Unit →	m/mn	mm/s	l/mn	Volt (for information)	Bar	P.S.I	Reading ref.	Volt (for information)	↗ in s	↘ in s
Down H.S. +	20	333	49	7.4	30	435	Pp2	1		
Down L.S. +	1,5	25	4	0,4	30	435	Pp2	1		
UP H.S. -	20	333	51	7.5	160	2320	Pp2	6,5		
UP L.S. -	1,5	25	4	0,4	160	2320	Pp2	6,5		
Low speed max +	6	100	15	2,2	30	435	Pp2	1		
Low speed max -	6	100	15	2,2	160	2320	Pp2	6,5		
Constant										
Retaining valve M.6					150	2175	M.3			

NOTE :

The low speed is the max speed allowed when an encoder anomaly is detected.

SCHEMATIC VIEW OF SHOVEL 2nd LIFTING STROKE FUNCTIONS.

temporization



NOTE : The slowing down induced by the encoder (**SH-ZT-01**) must not prevent the high speed starting up in reverse movement .

The end limit (Elect. Item **SH-ZSH-03**) on UP STOP check the encoder operating and correct tool positioning.

The cylinder stop is also detected by a pressure increasing given by the analogic pressure probe (**HU-PT-02**)

5.6 PROCEDURE FOR HYDRAULIC FLUID FILLING

ECL Document reference code : 1-10-741-46 rev.00

1. OIL FILLING PROCEDURE

1.1. PRELIMINARY

Use the recommended oil, see "lubrication instructions".

Adhere to the oil filling procedure to prevent dust introduction in the oil circuit

Replace the filtering elements, see "lubrication instructions", during these operations, take all the necessary precautions (clean before dismantling)

Use a filling unit with filtration (5 microns maxi, 3 microns is better)



SAFETY

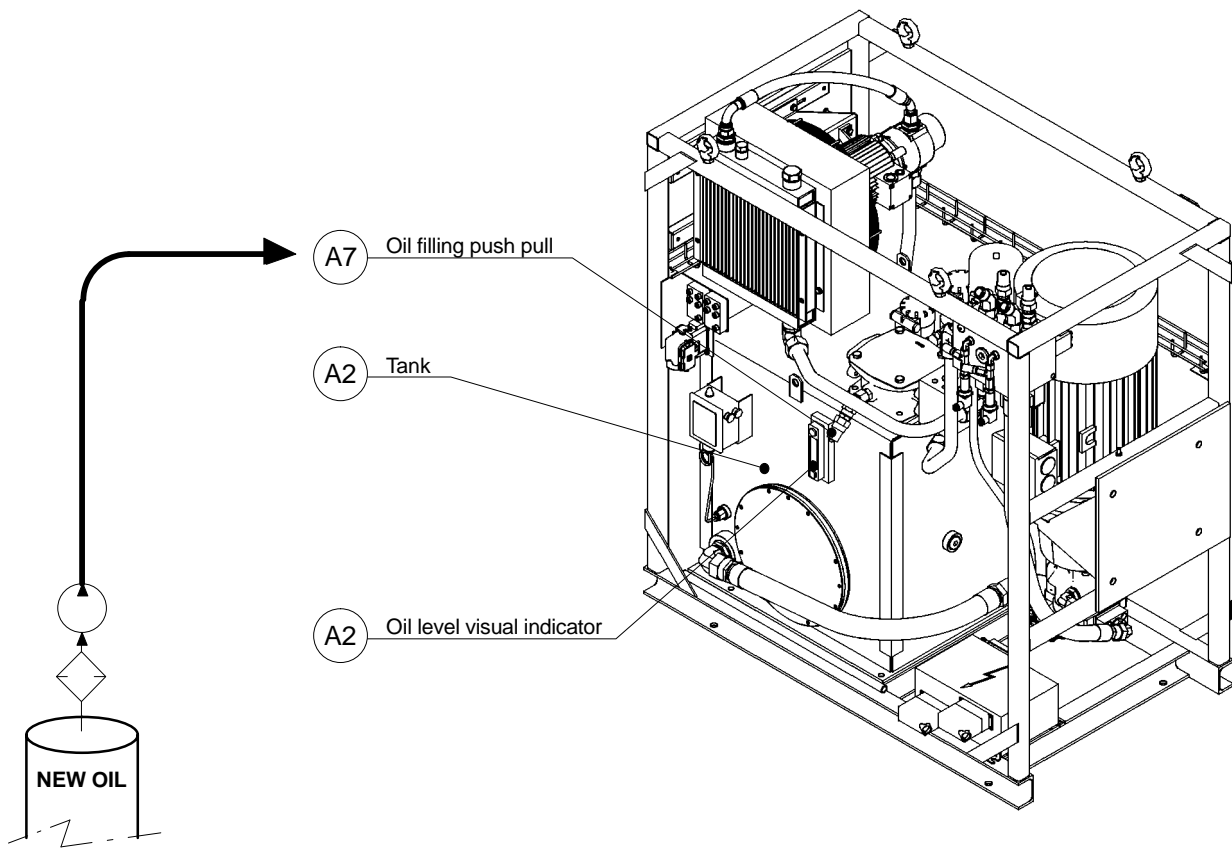
- For all operations on the hydraulic unit, adhere to the orders and safety rules in effect on site **"SEE LOCAL REGULATION"**
- Raise all tools in high position (retracted cylinders rods)
- Stop the machine, then remove the key switch
- Push the **STOP BUTTON** of the tending trolley access
- The operation must be only carried out by a **QUALIFIED OPERATOR**, knowing the operation of the machine and the technical knowledges for the hydraulic system.
- **WARNING:** when oil filling procedure, it will be necessary to restart the machine and control some movements . In this case, leave the working zone **NO OPERATOR PRESENT ON THE MACHINE** and check all safety conditions before movement .
- After all maintenance operations, remove all hydraulic oil marks and clean the retention tank under the unit.

1.2. FILLING OF THE HYDRAULIC UNIT

- Ensure at starting that **ALL CYLINDERS RODS ARE RETRACTED**
- Remove the cap located on the filling union (**A7**)
- Clean the filling union (**A7**)
- Connect the filling unit hose on the union (**A7**)
- Fill the oil tank (**A0**) until **THE MAXI HYDRAULIC FLUID LEVEL** is reached, maxi level seen on the indicator (**A2**).
- After filling with oil, respect an approximative delay of 10 hours to allow the oil to be degassed.
- Start the pump then activate, at low speed, and successively, all the receiver (except in case of make-up)
- Drain the circuit and especially all cylinders (except in case of make-up)
- Position **ALL CYLINDERS RODS ARE RETRACTED**, at low speed, and successively, (except in case of make-up)
- Add oil if necessary to obtain the **MAXI** level of the tank and **NEVER** exceed.

NOTA : a) If after a delay of operation, an oil make-up is necessary, to proceed in the same way.
b) After an intervention on the hydraulic group or a receiver, to proceed in the same way.

Figure 1 : Oil filling



5.7 HYDRAULIC CYLINDER VENTING – EXAMPLE

The following notice describes an example of the venting of a cylinder equipped with an over center valve at the rod.

1. PRELIMINARY OPERATIONS

- Some cylinders, require careful venting, in this instance, adhere to the procedure described hereafter carrying out preliminary venting.
- Before venting, adhere to the safety instructions.
- Check the oil level.

2. VENTING PROCEDURE

2.1. VENTING THE ROD END (FIGURE 3)

- Extend the rod completely
- Reduce the pressure of the " **ROD RETRACTED** " function to a value preventing this movement.
- Actuate the " **ROD RETRACTED** " function and vent via the pressure tap **(A)**
- Close the tap **(A)** by maintaining the function actuated.

2.2. FIRST VENT OF BOTTOM END (FIGURE 4)

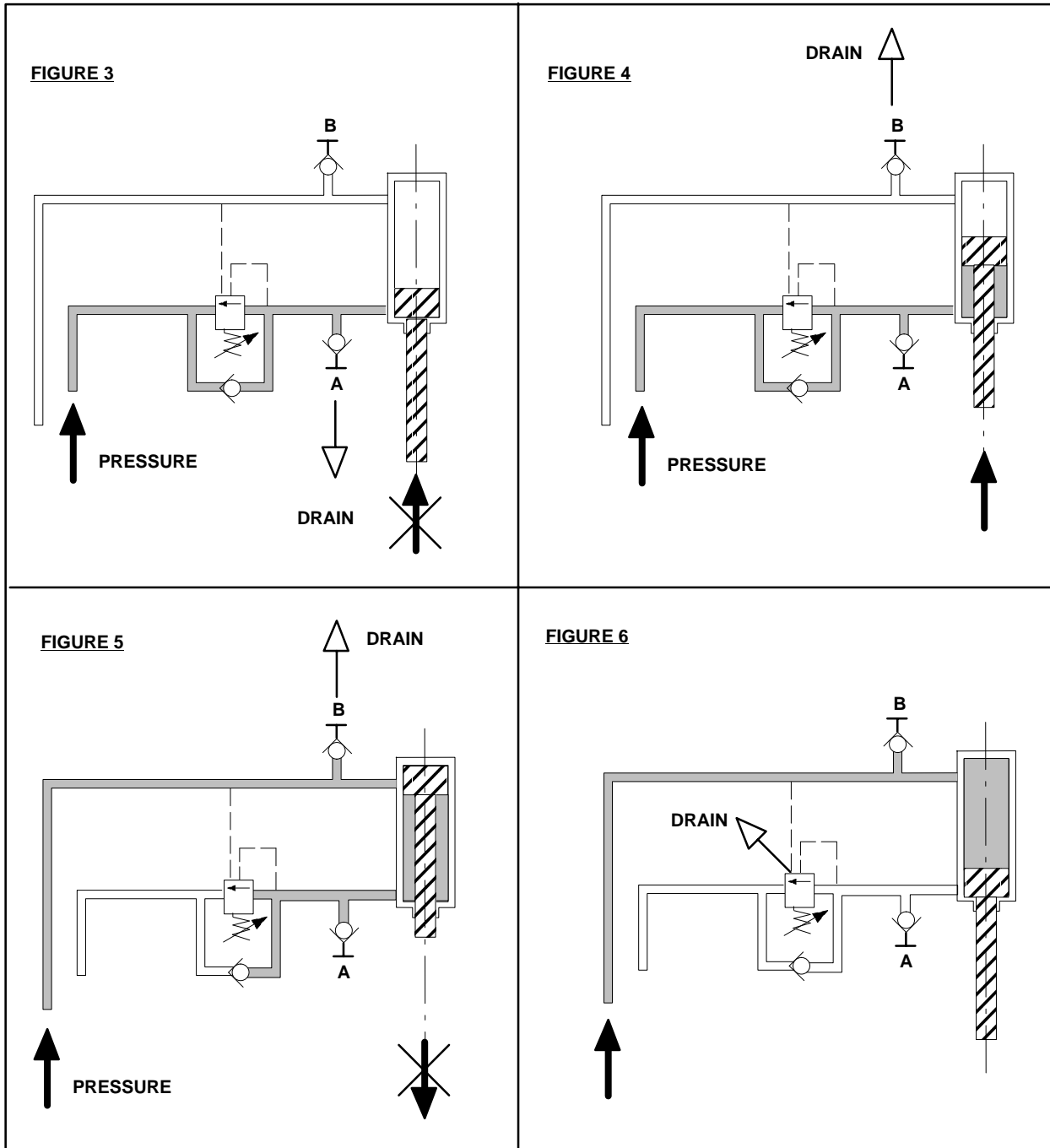
- Retract the rod by reducing the pressure of the " **ROD RETRACTED** " function as much as possible so as to obtain a slow movement and vent via the tap **(B)**.
- When the cylinder abuts, maintain the functions actuated and close the tap **(B)**.

2.3. FINAL VENT OF BOTTOM END (FIGURE 5)

- Reduce the pressure of the " **ROD EXTENDED** " as much as possible in order to prevent this movement and if this is not sufficient, increase the adjustment of the over center valve.
- Actuate the " **ROD EXTENDED** " function and vent via the pressure tap **(B)**.
- Close the tap **(B)** by maintaining the function actuated.

2.4. VENTING EXTERNAL PILOT OF OVER CENTER VALVE (FIGURE 6)

- Extend the cylinder rod.
- Actuate the " **ROD EXTENDED** " function and loosen the pilot hose of external pilot fitting in order to vent the external pilot.
- Tighten the pilot hose back up by maintaining the function actuated.



5.8 KIT 60 L/MN FOR MEASURE & ADJUSTMENTS OF HYDRAULIC UNIT**REMARK**

The tooling hereafter described is recommended to carry out the adjustments of the hydraulic group and functions, flow and pressure adjustments, when first starting up, maintenance operations and in case of pump and some components replacement.

NOTE

The following kit is not delivered in the main contract order, but may be delivered if specific customer order.

CONTENTS

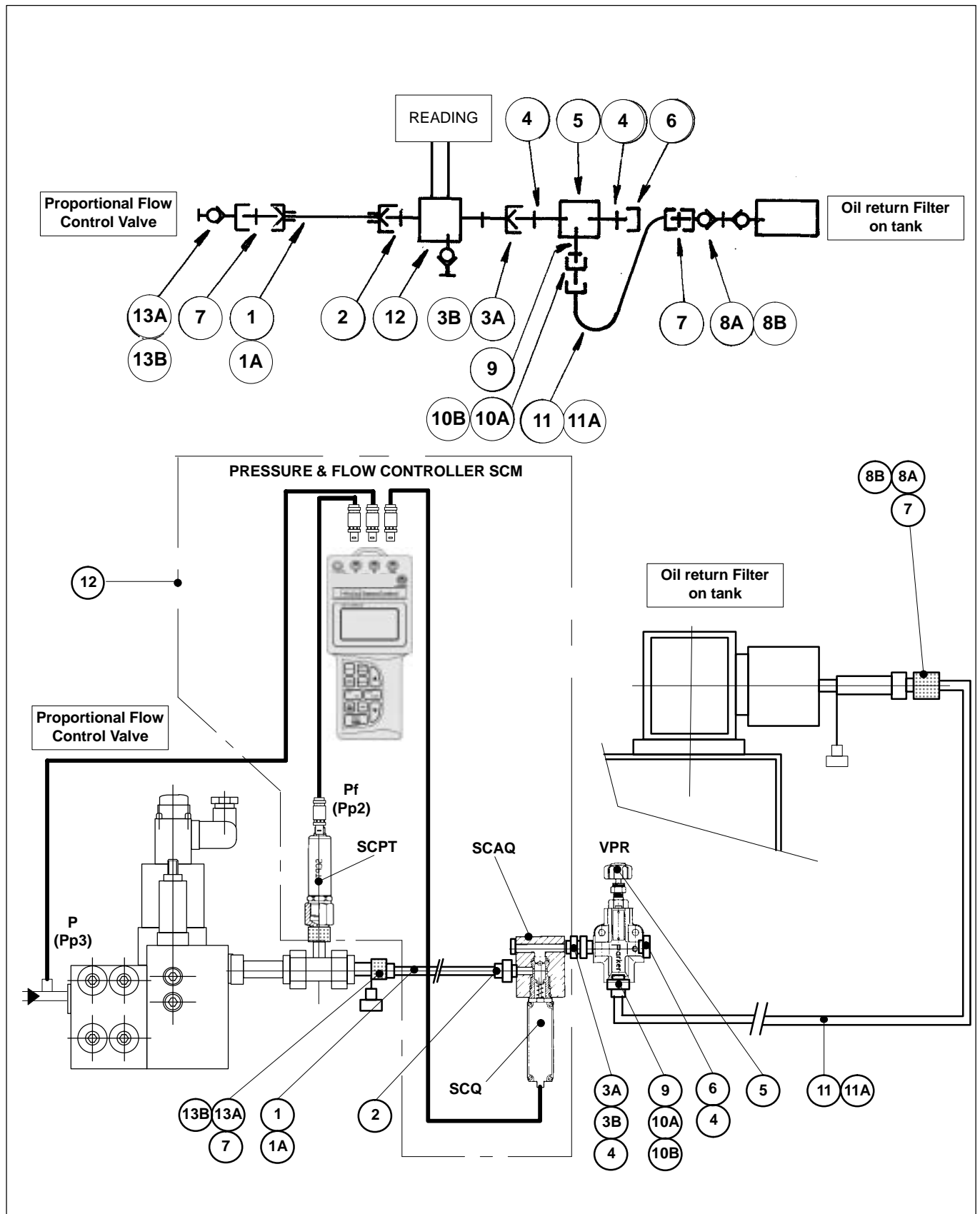
- 1 – Components list (Kit 60 l/mn max)
- 2 – Connection diagram
- 3 – Measuring system SC-740
- 4 – Measuring instrument SCM-330-2-02 pressure and flowrate
- 5 – Pressure sensor SCPT-.....-0-02
- 6 – Flow sensor SCQ-.....-0-02
- 7 – Pressure limiter VPR 16 B-272 viton

1. COMPONENTS LIST FOR KIT, E.C.L. CODE : 1-10-092-65

ECL update April 2010

Ref	Description	QTY	ECL code	Observation	Stock Nr
1	HOSE NO-SKIVE DN16 REF.372-10 16/29	1	0-02-018-30		
1A	SWIVEL FEMALE PERMANENT SWAGE FITTING REF 10670-12-10 SM	2	0-05-038-22		
2	UNION MM JIC BSPP REF.BA201208 VITON RASTELLI.	1	0-10-335-58		
3A	ADAPTATOR MF BSPP JIC REF.BA491008 VITON RASTELLI.	1	0-12-335-49		
3B	STUD ADAPTOR MF JIC JIC REF.BA311210 RASTELLI.	1	0-10-335-94		
4	UNION MM JIC BSPP REF.BA201216 VITON RASTELLI.	2	0-10-335-60		
5	PRESSURE LIMITER VPR 16 B-272 VITON, P = 1" BSPP, T = 1"1/4 BSPP PARKER	1	0-03-327-17		
6	PLUG FEMALE JIC REF.BA430012 RASTELLI	1	0-12-335-04		
7	UNION MM JIC NPT REF.BA251212 RASTELLI.	2	0-11-335-71		
8A	HYDR.MALE PUSH-PULL FD56-1062-12-12 06 A 3/4"-14	1	0-04-333-02		
8B	FEMALE PLUG 5657-12 3/4"-14	1	0-05-339-13		
9	UNION MM JIC BSPP REF.BA201620 VITON RASTELLI.	1	0-10-335-63		
10A	STUD ADAPTOR MF JIC JIC REF.BA311612 RASTELLI.	1	0-10-335-95		
10B	NUT REF.BA130016	1	0-12-335-32		
11	HOSE NO-SKIVE DN16 REF.372-10 16/29	1	0-02-018-30		
11A	SWIVEL FEMALE PERMANENT SWAGE FITTING REF 10670-12-10 SM	2	0-05-338-22		
12	BOX SC 740 WITH HYD. TOOLS ASS'Y : -121- Suit case SCC-DRV-300 -122- Flow transducer SCQ-060-0-02 VITON -123- Block SCAQ-060 -124- Pressure sensor SCPT-600-02-02 VITON -125- Adaptator SCA-R1/2-ED -126- Cable L 3000 SCK-102-03-02 -127- Extension piece L 5000 SCK-102-05-12 -129- Hand-held measuring instrument SCM-330-2-02 -130- Eolastic seal ED 1/2" BSPP SC921 VITON	1 1 1 1 2 1 3 2 1 4	1-10-092-66 1-10-775-46 0-00-244-14 0-01-331-63 1-10-206-59 0-08-334-03 1-10-347-55 1-10-364-56 1-10-759-50 1-10-206-14		
13A	HYD.FEMA. PUSH-PULL FD56-1064-12-12 06 A 3/4"-14 AEROQUIP.	1	0-04-333-03		
13B	MALE PLUG 5659-12 3/4"-14 AEROQUIP.	1	0-00-339-18		

2. EXAMPLE OF A CONNECTION DIAGRAM



3. MEASURING SYSTEM SC-740

The measuring system with graphic printer (option) for pressure-, temperature-, throughflow-, voltage- and current-measurement

- Lockable equipment case with insert
- Hand-held measuring device SCM
- Graphic printer (Option)
- Sensors with self identification
- Accumulator batteries and recharging unit
- Adapter for measuring connections
- Both battery and mains operation possible
- Extendable using adapter set
- Extendable using throughflow sensors



3.1. GENERAL

SensoControl handmeters and complete measuring systems are perfectly suited measuring tools for every application. Whether they are used in the industrial area, in mobile hydraulics, for service or repair: measuring and processing of hydraulic values is the basis of safe trouble shooting. The systematic search of errors with modern means is something the service engineer simply cannot do without.

High-speed processes, such as switching valves, cylinder strokes, pressure peaks, differential pressures and flow changes must be measured and evaluated simultaneously.

The new SensoControl handmeters of the **ServiceMaster** series have been specially developed for these applications: measuring and displaying of all hydraulic values, such as pressure, differential pressure, pressure peaks, temperature and flow, as well as speed. They are perfectly suited for the mobile recording of measured values and feature high precision combined with easy operation.

All measuring devices as well as their accessories are manufactured and tested in our own plants. Our constantly growing demands on quality and flexibility make Parker a reliable partner.

3.2. AREAS OF APPLICATION

The **ServiceMaster** is a multi-channel handmeter for the simultaneous measuring of important hydraulic values:

All hydraulic parameters such as pressure, differential pressure, flow and hydraulic power can be measured, displayed, stored and processed.

4. HAND-HELD MEASURING INSTRUMENT SCM-330

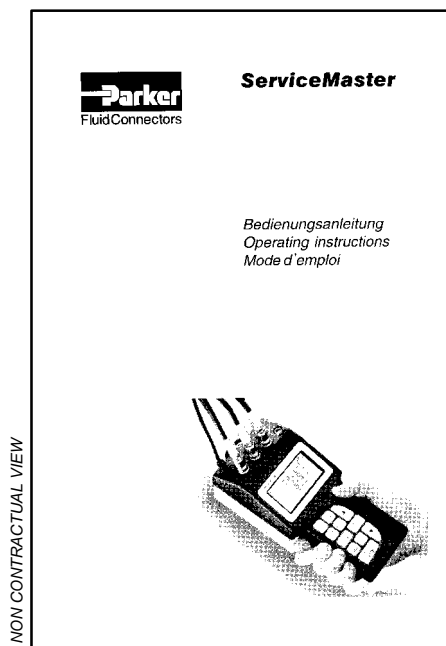
The following notice (ServiceMaster EASY) describes the ServiceMaster measuring handmeter.

See also specific Operating instruction manual delivered with the SensoControl handmeter for a performed used.

Front page of The ServiceMaster EASY



Front page of The ServiceMaster Operating Instruction manual SCM



5. PRESSURE AND TEMPERATURE SENSOR SCPT

for connection to the Senso Control hand-held measuring system

- Lemosa-type precision plug connector
- Automatic coding measuring range
- Corrosion-proof, stainless steel housing
- ED seal (viton)
- Fully encapsulated
- Very low current requirement
- Relative/absolute
- Temperature compensation: 0...85°C



5.1. GENERAL

This model of the piezo-resistive SCPT pressure and temperature sensor was developed specifically for connection to the SCM hand-held test instrument and the SCGP graphics printer. It has already been tried and tested many times in daily use. The design of the SCPT ensures reliable functioning in combination with the greatest possible ease of operation. One of its many significant features is the precision connector, which enables the cable connection to be made "blind". When installing the sensor, the ED seal need only be tightened by hand to ensure a leakfree connection to the pressure medium. An additional helpful function is the automatic identification of the measuring range when used in conjunction with the hand-held test instrument SCM-200. The stainless steel housing enables it to be used in almost all applications of fluid engineering.

Because it is a pressure and temperature sensor, the two most important hydraulic parameters can be measured simultaneously.

5.2. SPECIFICATIONS

SCPT	600
Pressure range (bar)	0...600 absolute
Temperature measuring range (° C)	– 25 ...+ 105
Overload pressure (bar) max.	1 000
Output signal (V)	0...3
Linearity error (%of full-scale value)	0.35*
Reproducibility (%of full-scale value)	0.2*
Characteristic curve deviation (% of full-scale value) Tolerance band adjustment *	0.5*

valid in 0...400 bar range

INPUT

Measuring media _____ Gases, liquids

OUTPUT

Load

(for use without hand-held test instrument) — ≥ 2 mohms

Temperature-compensation zero point — $\pm 0.012\%$ FStC

Temperature-compensation sensitivity — $\pm 0.02\%$ FS/C

Response time — < 1 ms

Output signal noise — < 0.1 °h FS

Resonance frequency approx. — 100 kHz

Long-term stability — $< 0.5\%$ FS/a

Shock resistance — 100 g

Pressure peak rise time — 15000 bar/sec.

Temperature signal — 0...2 V -50...+150°C

Temperature output at 0° C — 0.5 V

Response time t 0.5 — 7 sec.

Response time t 0.9 — 22 sec

Accuracy — $\pm 1,5\%$
of the measuring range, valid in the compensated range

Voltage supply

Auxiliary power Ub

(for use without hand-held test instrument) - 7...12 V DC

Permissible residual Ub ripple — $\pm 2\%$ ss

Current requirement — ≤ 5 mA

Environmental conditions

Working temperature rang — -20...+85° C

Fluid temperature rang — -25...+ 105 ° C

Temperature-compensated range — 0...85 ° C

Storage temperature range — -40...+125° C

General

Connection to measuring media — Threaded stud M 22x 1.5

Material – Housing — 1.4462 or 1802

Material – Diaphragm — 1.4301

Seal — ED soft seal (viton)

Electrical connection

No overvoltage protection No protection against accidental miswiring Short-circuit protection

Plug connector — Lemos-a-type, Series S, Size 1, 5-pin, degree of protection IP 54

Weight approx. 125 g

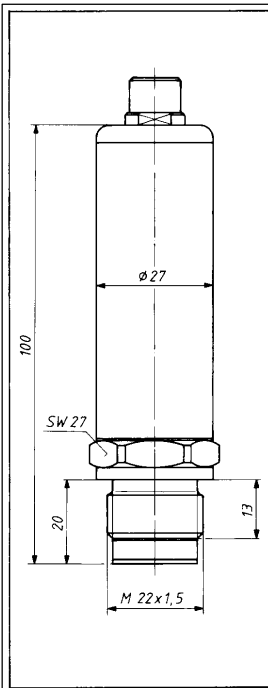


Fig. 1: Dimensional drawing of SCPT

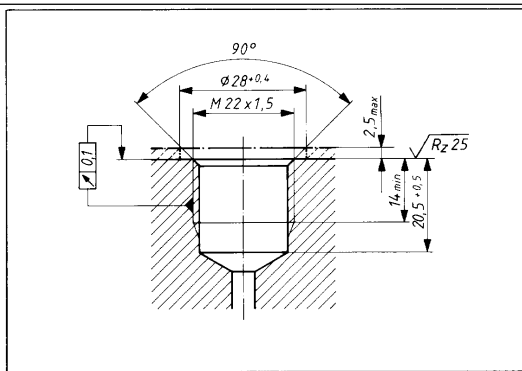


Fig. 2: Screw-in thread

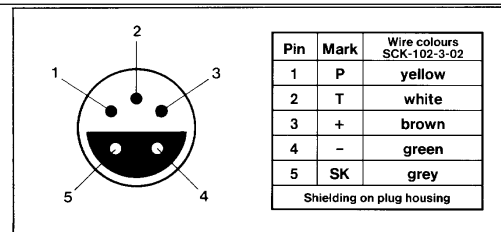


Fig. 3: Connector assignment

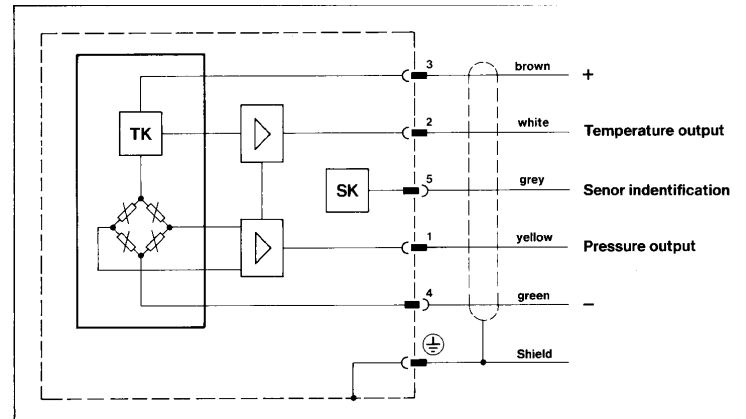


Fig. 4: Block diagram

5.3. PART NUMBER INDEX

Model	Part no
Pressure and Temperature Sensor SCPT – Voltage output	SCPT-...-0-02
Measuring range (...)	
– 0 015 bar	010
– 0 060 bar	060
– 0 150 bar	150
– 0 600 bar	600
Cable (connection between Hand-held Test Instrument SCM & Sensor SCPT), 2m long	SCK-102-3-02
Cable (connection between Graphics Printer SCGP and Sensor SCPT), 2 m long	SCK-112-3-20
Extension cable for SCK-102-3-02 or SCK-112-3-20, 3 m long	SCK-202-1-02
Packing ring: EOLASTIC ED M 22x 1.5	SC-9..
Material: Viton or S8R please specify (..)	01
	02

- Maximum cable length between sensor and hand-held test instrument or graphics printer: 5 m
- For adapter, see Data Sheet 4084 – D1 /GB

6. SCQ FLOW TRANSDUCER

Reversible flow measurement showing direction of flow, for mobile and stationary measuring systems

- Compact cartridge of nominal size 10 or 16 provides for rapid fitting
- Sandwich mounting for vertical linkage
- In-line or flange mounting
- Response time c 1 ms
- Pressure-proof up to 420 bar
- High repeat accuracy



6.1. GENERAL

Flow measurement is extremely important in the field of high pressure hydraulics. Rapid recording and comparison of measured values for flow rate, pressure and in some instances temperature provide reliable conclusions concerning the dynamic behavior of hydraulic systems. Thanks to its cartridge shape, the sensor element can be fitted in control blocks, in sandwich plates and on threaded connection blocks suitable for tube, hose or flange mounting.

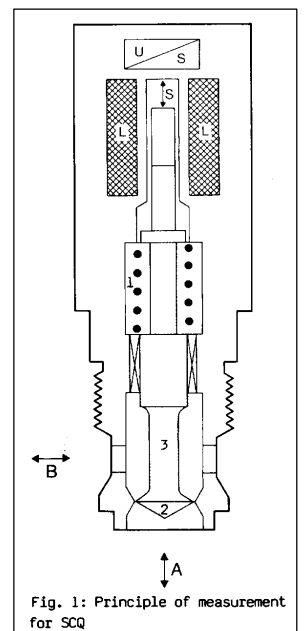
This reduces complex, cost-intensive installation operations such as those for orifice-plate or turbine systems.

The sturdy, hardwearing sensor element makes it possible to **measure data continuously, even under unfavourable conditions** such as large numbers of stress cycles or rapid pressure increases.

6.2. FUNCTIONAL DESCRIPTION

The design of the sensor element is based on the target flow principle.

When there is no flow, the spring (1) holds the orifice plate (2) in the zero position. A fluid flow from A to B or from B to A deflects the piston rod (3) which is connected to the orifice plate. The differential transformer and integrated electronic system convert this flow-proportional change in position into a linear, temperature-compensated voltage output signal of $-3\text{ V} \dots 0 \dots +3\text{ V}$, which also indicates the direction of flow.



6.3. TECHNICAL DATA*

* Technical data provisional and subject to change

Input

Measuring range _____ 1 ... 060 l/mn.
 _____ 4 ... 150 l/mn.

Flow measured in both directions with indication of direction

Working pressure _____ 3 ... 420 bar
 Measuring medium _____ Hydraulic fluid
 Viscosity range _____ 15 ... 160 cSt.

Output :

0 ... +3 V Direction of measurement A to B

0 ... -3 V Direction of measurement B to A

Output ripple _____ 5 mV
 Characteristic curve deviation _____ $\pm 2\%$ FS calibrated to 46 cSt.
 Resistance _____ $> 500 \text{ kohm}$
 Thermic drift _____ $\pm 0.05\% / ^\circ\text{C}$ of full scale
 Response time _____ $< 1 \text{ msec}$
 Repeat accuracy _____ 0.5% FS
 External power supply _____ $+7 \dots +12 \text{ V DC}$
 Permissible ripple _____ $\pm 2\%$
 Current consumption _____ Approx. 20 mA

Ambient Conditions

Ambient temperature _____ $0 \dots 70^\circ\text{C}$
 Measuring medium temperature _____ Max. 80°C
 Temperature-compensated range _____ $+10 \dots +60^\circ\text{C}$
 Storage temperature _____ $-40 \dots +125^\circ\text{C}$

General

Connection to measuring media _____ Threaded cartridge nom. size 10 or 16
 Housing _____ Steel, surface corrosion-proof
 Operating position _____ As required
 Installation _____ Via cartridge hole, sandwich plate or threaded/flange connection block

Electrical Connection

Via 5-pin LEMOSA type connector
 Voltage output to SCM hand held instrument

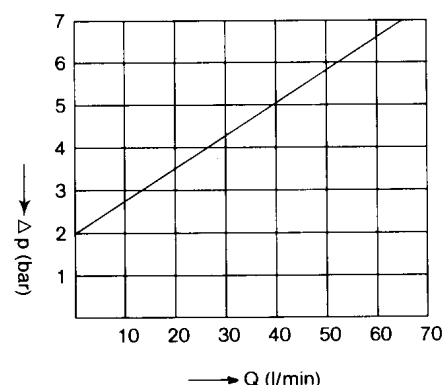
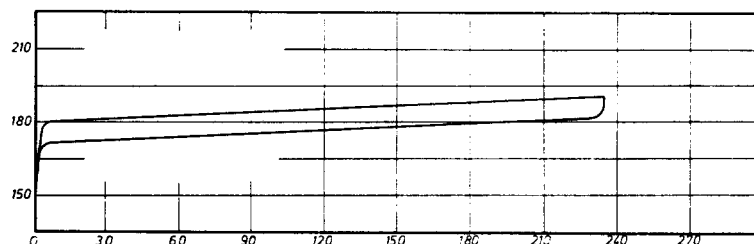
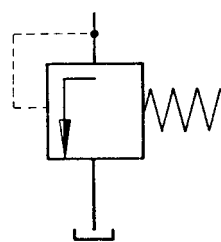
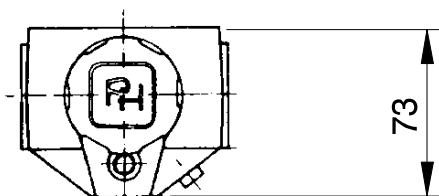
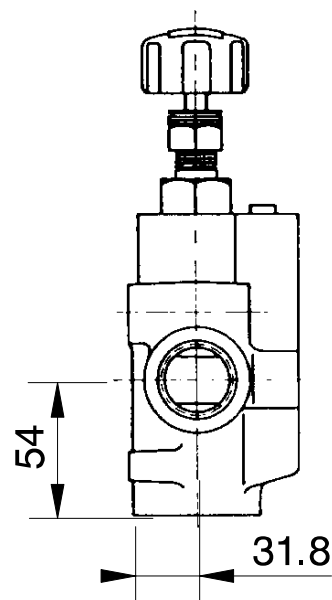
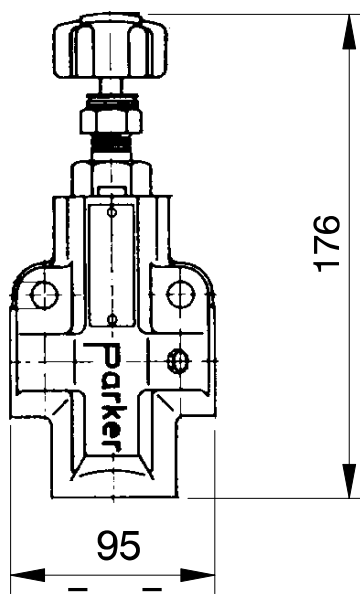


Fig. 2: Delta-P -
Q characteristic curve

7. PRESSURE LIMITER VRP16 B-272 VITON



- Nominal flow : ————— $Q_n \approx 200 \text{ l/mn}$
- Working pressure : ————— $P_n \approx 320 \text{ bars}$ (pressure rate 1–40 bars and 40–320 bars) maxi outlet pressure 150 bars
- Fluid : ————— hydraulic mineral oil according to standard VDMA 24318
- Viscosity : ————— 10 ... 350 Cst
- Temperature : ————— $-20 \dots +85^\circ\text{C}$
- Installation : ————— all positions



5.9 THE SERVICEMASTER DEVICE

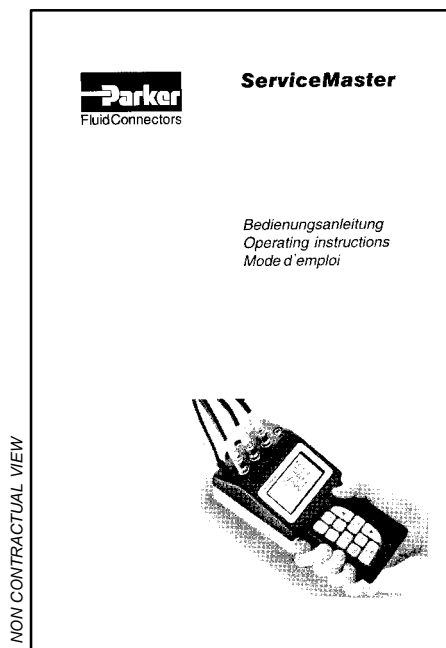
The following notice (Servicemaster EASY) describes the ServiceMaster measuring handmeter

See also specific Operating instruction manual delivered with the SensoControl handmeter for a performed used.

Front page of The ServiceMaster EASY



Front page of The ServiceMaster Operating Instruction manual SCM



The **Parker** Service Master *Easy*

Bedienungsanleitung

[Operating instructions](#)

Mode d'emploi

Istruzioni per l'uso

Instrucciones para el manejo



Foreword
Revisions

Version	Date	Change
1.0	12/2006	First edition

Contact address



Parker Hannifin GmbH & Co. KG
Tube Fittings Division Europe
Postfach 12 02 06, 33652 Bielefeld
Am Metallwerk 9, 33659 Bielefeld
Phone +49 521/40 48-0
Fax: +49 521/40 48-42 80
E-mail: Ermeto@parker.com
<http://www.parker.com>

ENGLISH

Contents	
Contents	67
Foreword	67
Revisions	
1. Notes on safety/product selection	71
1.1 Approved use	71
1.2 Skilled personnel	71
1.3 Accuracy of the technical documentation	71
1.4 High-pressure applications	71
1.5 Service/repair	72
1.6 Notes on disposal	72
2. Device version/range of supply	74
3. Initial use	75
3.1 Charging the batteries/battery status indicator	75
3.2 Replacing the batteries	75
4. Keys and functions	76
4.1 Symbols and using the menus	78
5. Connecting the sensors/display functions	80
5.1 Display format (DISP)	81
5.2 Display configuration (LINE)	82
5.3 Zero point calibration (ZERO)	83
5.4 Deleting MIN/MAX values (RESET)	84
5.5 Differential value display	84
5.6 Differential value alignment (IN1=IN2)	85
5.7 Connecting auxiliary sensors (SET AUX. SENSOR)	87
5.8 Error messages/warnings	90

Contents	
6. Device settings (SET)	92
6.1 Setting the units (SET-UNIT)	94
6.2 Auto power off (SET-AUTO POWER)	94
6.3 Setting auxiliary sensors (SET AUX. SENSOR)	94
6.4 Displaying defined measurement tasks (SET-PROJECT)	95
6.5 Setting the contrast (SET-CONTRAST)	96
6.6 Setting the time/date (SET-TIME/DATE)	96
6.7 Displaying the device version (SET-VERSION)	96
6.8 Factory setting (USER RESET)	97
7. Configuring the measured value memory (MEMORY SET)	98
7.1 Deleting measured value memory (MEM-DELETE MEMORY)	100
7.2 Setting the data format (MEM-DATA FORMAT)	100
7.3 Setting the recording format (MEM-REC-CONFIG)	101
8. The REC menu	102
9. Recording measured values	104
9.1 Settings for recording measured values (REC)	104
9.2 The REC NAMES setting	105
10. Setting and operating via PC	118
10.1 Connecting to a PC	118
10.2 Operating/configuring via PC	119
11. Accessories	120
12. Technical data	121
13. Description of the memory functions	123

1. Notes on safety/product selection

1.1 Approved use

The device is approved for use in applications described in the Operating Instructions only. Any other use is not approved and can lead to accidents or the destruction of the device. Non-approved use will result in the immediate expiry of all guarantee and warranty claims against the manufacturer.



Serious malfunctions leading to personal injury or damage to property can result from using the chosen product in applications that do not comply with the given specifications or from disregarding the operating instructions and warning notes.

1.2 Skilled personnel

These operating instructions have been written for skilled personnel who are familiar with the valid regulations and standards applicable to the field of application.

1.3 Accuracy of the technical documentation

These operating instructions were created with the utmost care and attention. However, we offer no guarantee that the data, graphics and drawings are correct or complete. Subject to alteration without notice.

1.4 High-pressure applications



Selection

When selecting pressure components, ensure that the overload pressure will not be exceeded.

It is possible that the pressure cell can be deformed when the overload pressure is exceeded (depending on the duration/frequency and level of the pressure spike).

The 'diesel effect' caused by entrapped air can result in pressure spikes that far exceed the overload pressure. The nominal pressure of the pressure component should be higher than the nominal pressure of the system to be measured.



Mounting

Please abide by the instructions and observe the correct tightening torques for the fittings or adapters being utilised.
Connector thread: 1/2" BSP = 90 Nm
1/4" BSP = 30 Nm

Please observe the highest pressures detailed in the catalogues for hydraulic fittings (ERMETO) or hydraulic hoses from Parker Hannifin.



1.5 Service/repair

For repairs to or calibration of the measurement instruments, please contact a Parker Hannifin sales branch.

1.6 Notes on disposal
Recycling in compliance with WEEE

Purchasing our product gives you the opportunity to return the device to Parker Hannifin at the end of its life cycle.



The EU Directive 2002/96 EC (WEEE) regulates the return and recycling of waste electrical and electronics equipment.

As of 13/8/2005 manufacturers of electrical and electronics equipment in the B2B (business-to-business) category are obliged to take back and recycle WEEE free of charge sold after this date. After that date, electrical equipment must not be disposed of through the 'normal' waste disposal channels. Electrical equipment must be disposed of and recycled separately. All devices that fall under the directive must feature this logo:

Can we be of assistance?

Parker Hannifin offers you the option of returning your old device to us at no extra charge. Parker Hannifin will then professionally recycle and dispose of your device in accordance with the applicable law.

What do you have to do?

Once your device has reached the end of its service life, simply return it by parcel service (in the box) to your Parker Hannifin sales branch responsible for customer care - we will then initiate the necessary re-cycling and disposal measures. You will incur no costs or suffer any inconvenience.

Any questions?

If you have any questions, please contact us or visit our website: www.parker.com

ENGLISH

2. Device version/range of supply

The measuring instrument and sensors enable the user to measure all relevant parameters in a hydraulic system.

Parameters:

- [bar/psi] Pressure, Δp (load sensing pumps)
- [°C/°F] Temperature
- [L/min/G/min] (U.S) volumetric flow rate
- [1/min] RPM

Automatic sensor recognition means the measuring instrument is simple to operate. It is not necessary to carry out any further settings to the device.

Plug & Work is one of the more important attributes of the device. It allows the measuring instrument to be ready to operate in an instance, and excludes erroneous measurements.

Keys and functions

3. Initial use

The measuring instrument is supplied with rechargeable batteries fitted at the factory.

Charge the rechargeable batteries for at least 3 hours before using for the first time. The device is then ready for use.

3.1 Charging the batteries/battery status indicator

If the battery power is too low, the battery symbol flashes and the measuring instrument turns off automatically.



Battery symbol

The measuring instrument is powered using the external power supply unit or via the car adapter. The battery can be recharged directly. The recharging process begins as soon as the power supply unit is connected.

- Please refer to the chapter 'Accessories' for more information about the external power supply unit and the car adapter.

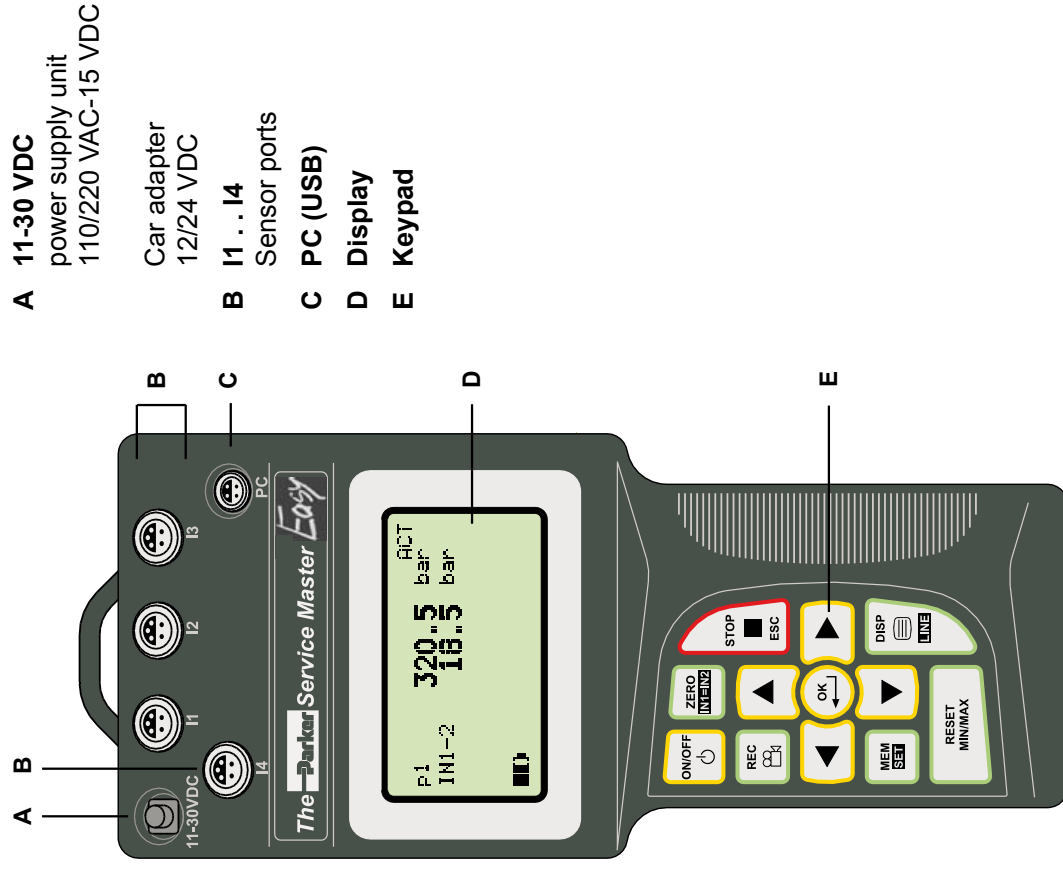
3.2 Replacing the batteries



Replacing the batteries



4. Keys and functions

A
B

A 11-30 VDC

power supply unit
110/220 VAC-15 VDC

Car adapter
12/24 VDC

B11:14

Sensor ports

C PC (USB)

Display

E Keypad

D

W

Function keys

	ON/OFF
	Confirms function/value
 	Selects function/value
	STOP/ESC

ENGLISH

Menu keys

* These menu keys are assigned dual functions:
Assignment 1. Menu level = 1 x press
Assignment 2. Menu level (black background) = 1 x hold key pressed down (2 s)

	ZERO IN1 = IN2	Zero point calibration Differential value alignment	*
	MEM SET	Memory configuration Main menu (device settings)	*
	DISP LINE	MIN-MAX/ACTUAL or FS display Display configuration	*
	REC	Record measured values	
	RESET MIN/MAX	Delete MIN/MAX values	

4.1 Symbols and using the menus

If the sign '>' is displayed at the end of a menu function, press the OK key to enter an associated submenu.
If the sign ':' is displayed, press the OK key to confirm the respective entry.

Menu symbols	Key	Function	Example
>		Call up a submenu/setting	UNIT>
:		Confirm	AUTO POWER: OFF
▲ ▼	 	Select	--SET--

Key assignments and symbols associated with the menu functions are consistent throughout this device; therefore, there will be no further explicit explanation given.

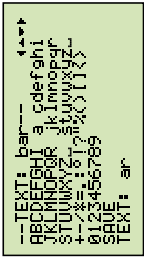
What the function keys do within the menus

Use the arrow keys to scroll between functions when several functions are available for selection in a window or a menu. The arrow keys move the cursor in the direction in which the arrow is pointing.
Press the OK key each time you wish select a function or submenu; when making alterations or adding values you must press OK to confirm your action. The OK key is used to save all settings. Press the STOP/ESC key if you wish to leave a menu or do not wish to save an entry.
Key assignment and mode of operation of these three keys is always the same no matter in which menu they are used.

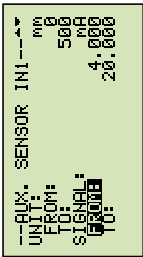
i As the function keys are easy to understand and always function in the same manner, actuating the function keys has not been included in the example sequences to ensure that the content of the menus remain central to the descriptions. It is a pre-condition for replicating the examples that the function keys are used as described above.

Example: setting the unit (text) and the measurement range (numerical)

Text input:
to set the units (max. 15 characters)

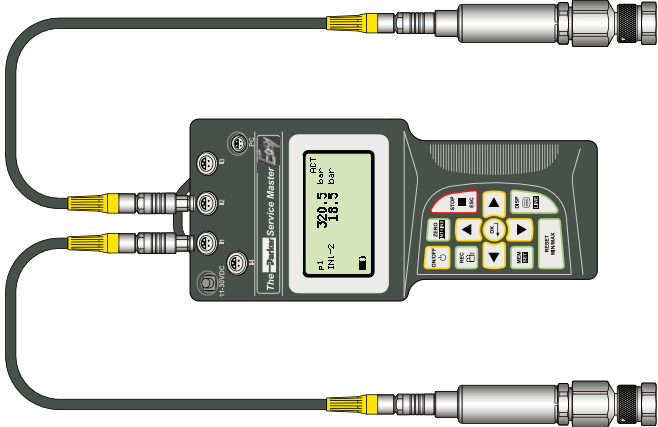


Numerical input:
to set the measurement range and signal span



5. Connecting the sensors/display functions

- i** To avoid electrical interference, please observe the following steps:
- 1 Connect the sensor to the measuring instrument using the connection cable.
 - 2 Turn on the measuring instrument.

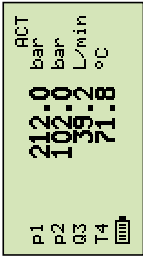


- Measuring instrument with two pressure sensors
- Once turned on, all measured values are visible in the display.
 - Automatic sensor recognition ensures that the measured value is indicated in the correct unit.
 - No further settings to the device are required.

- The following message will be displayed if no sensor is connected to the device:



5.1 Display format (DISP)



Press **DISP** (once)

It is possible to change the display format by pressing **DISP** (once only).

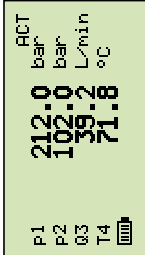
Available for selection:

- ACT** = Actual values
- MIN** = Minimum values
- MAX** = Maximum values (pressure spikes)
- FS** = Full scale (upper range value)
- TEMP** = Temperature display

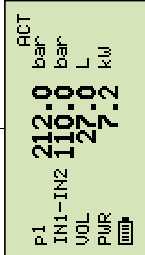
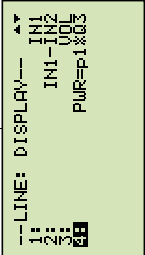
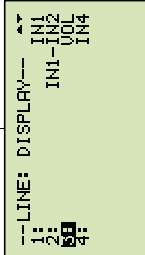
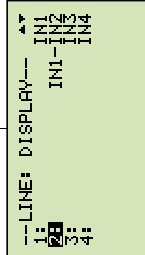
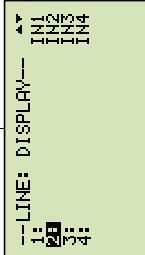
The **TEMP** display applies only to 'SCPT' type sensors.



5.2 Display configuration (LINE)



Press and hold **LINE** (2 s)

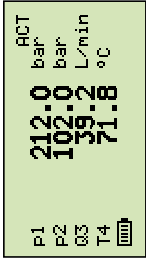


- Line:**
- 1: No setting possible cannot be selected
 - 2: Available for selection: **Difference** (IN1 - IN2) **Addition** (IN1 + IN2)

3: Volume VOL= Q3 x time

- 4: Available for selection:**
- Power**
PWR1 = p1 x Q3
PWR2 = (p1-p2) x Q3

5.3 Zero point calibration (ZERO)

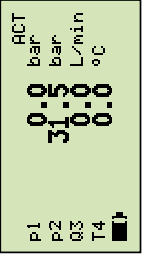
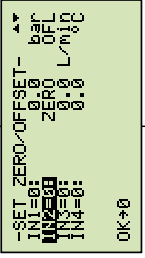
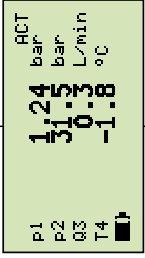
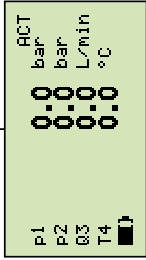
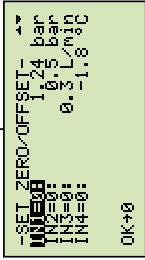
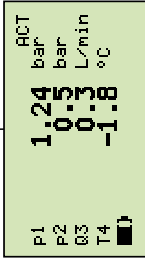


If the alignment values are within the permissible tolerance (2 % of FS), the values are set to zero.

If the alignment values exceed the permissible tolerance (2 % of FS), the following is displayed: ZERO OFL.



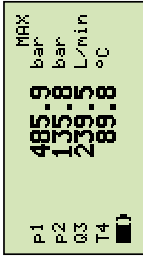
Press **ZERO** (once)



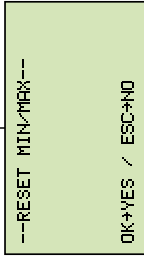
ENGLISH

5.4 Deleting MIN/MAX values (RESET)

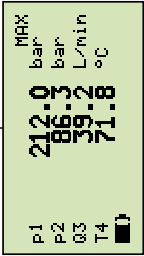
The MAX values measured until now are displayed in the MAX display.



Deleting MIN/MAX values.



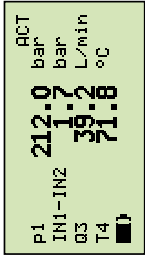
The updated MAX values are displayed in the MAX display.
Example: Loss of pressure in the hydraulic system



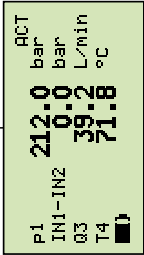
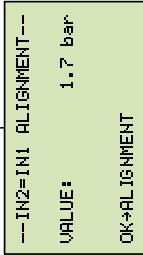
5.5 Differential value display

► The settings IN1 – IN2 are described in the chapter 'Display configuration (LINE)'.

5.6 Differential value alignment (IN1=IN2)



Press and hold **IN1=IN2** (2 s)



ENGLISH



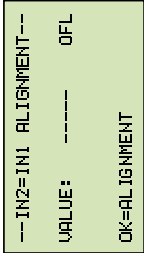
Carry out differential value alignments at below operating pressure. Connect two pressure sensors to the same connection (T-adaptor). Δp-calibration sets the tolerance of the sensors in relation to one another to zero.

This setting remains stored; it is valid only for the respective operating pressure.

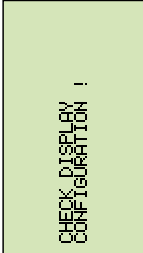
Three error messages are possible for IN1=IN2:

1 Alignment values exceed the permissible tolerance:

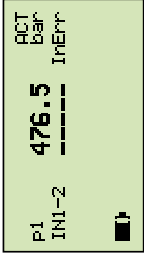
- For sensors with automatic sensor recognition, 5 % of the upper range value (FS)
- For auxiliary sensors, 10 % of the upper range value (FS)



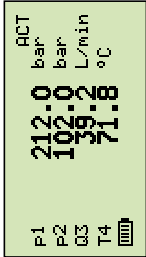
2 IN1 - IN2 is not configured (DISP-LINE):



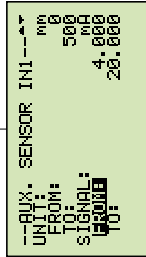
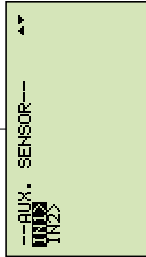
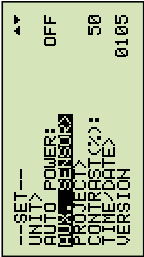
3 Measured variables are not the same (IN1=bar/IN2=L/min)



5.7 Connecting auxiliary sensors (SET AUX. SENSOR)



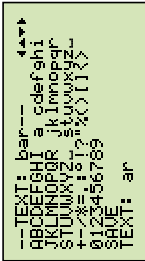
Press and hold **SET** (2 s)



Ensure that the electrical specifications of the auxiliary sensors are compatible with the measuring instrument/adapter. Please ensure correct PIN assignment and supply voltage and avoid short-circuits!

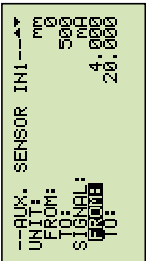
Text input for UNIT/SIGNAL

To set the units:
Text input up to max. 15 characters.

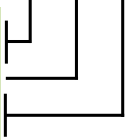


Numerical input for FROM/TO

To set the measurement range and signal span
3-digit prefix, decimal point, 3-digit suffix.

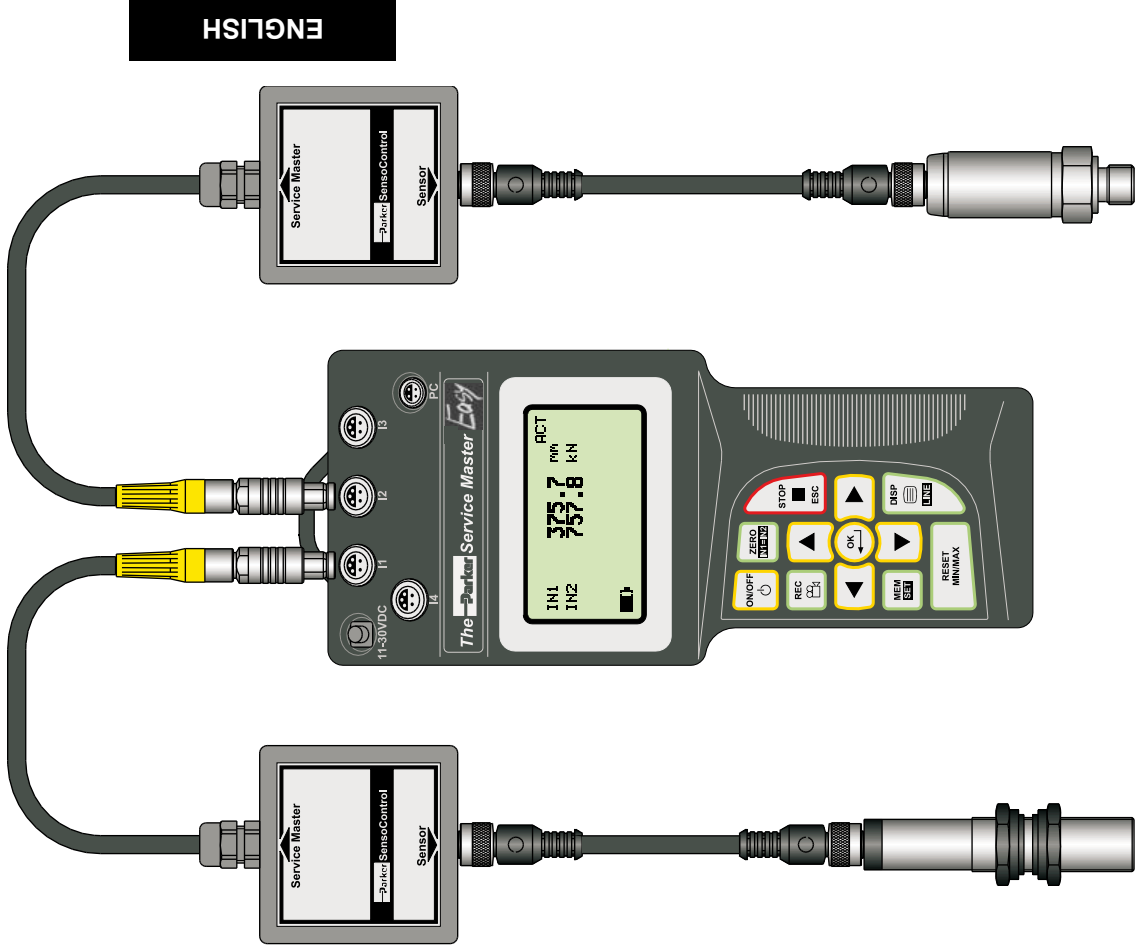


000.000



Connecting auxiliary sensors:

Measuring instrument with connector adapter and sensors for distance (mm) and force (kN).



5.8 Error messages/warnings

Display	Description	What action to take?
NO SENSOR	No sensor is connected	Turn off the measuring instrument Connect sensor Turn on the measuring instrument
%	An auxiliary sensor is connected.	Carry out settings in the menu SET-AUX.SENSOR
P1 118.4 L/min	Sensor recognition interrupted (cable break or input defect)	Send measuring instrument, sensor and connection cable to Parker Hannifin.
P2 118.4 L/min	Measurement range overflow The measured pressure is outside of the measurement range	Release pressure from the system Use sensor with wider measurement range
SET ZERO-OFFSET OK	Overflow ZERO The zero point offset value exceeds the tolerance	Check only when no pressure is applied
IN2=IN1 ALIGNMENT VALUE1 --- OFL OK ALIGNMENT	Overflow IN1 = IN2 Differential value alignment The alignment value exceeds the tolerance	Test system pressure Use sensors with wider measurement range
CHECK DISPLAY Configuration !	DISP LINE IN1 = IN2 Wrong setting	Configure IN1-IN2
P1 IN1-2 476.5 bar	Overflow IN1 - IN2: Differential value alignment	Measured variables (sensors) must be the same IN1 / IN2 = bar IN1 / IN2 = L/min IN1 / IN2 = °C
MEMORY FULL	Measured value memory full	Download measured values to PC Delete measured value memory

Display	Description	What action to take?
<div>NOT IN FAST MODE ACCESSIBLE</div>	Do not use in FAST MODE	Setting REC: START-STOP/POINT FAST MODE only for AUTO TRIGGER MANUAL possible
<div>FAST MODE CONFLICT ! SET < 0.5 ms</div>	Recording time conflict (DURATION) FAST MODE (0.5 ms)	REC setting AUTO TRIGGER MANUAL Alter recording time DURATION
<div>SETTING CHANGE RECORDING RATE = 100ms</div>	Recording time conflict (REC RATE)	Setting MEM-SET REC CONFIG REC RATE Alter recording interval REC RATE. Press OK to confirm

ENGLISH

6. Device settings (SET)

P1

212.0

bar

P2

102.0

bar

Q3

35.2

L/min

T4

71.8

°C

MEM SET

Press and hold SET (2 s)

--SET--

UNIT>

AUTO POWER>

AUX. SENSOR>

PROJECT>

CONTRAST<>

TIME/DATE>

VERSION

OFF

50

0105

--UNIT--

TEMPERATURE:

FLOW:

POWER:

bar

°C

L/min

kW

--SET--

UNIT>

AUTO POWER>

AUX. SENSOR>

PROJECT>

CONTRAST<>

TIME/DATE>

VERSION

OFF

50

0105

--AUX. SENSOR--

UNIT>

SIGNAL:

FROM:

TO:

bar

121

mm

4.000

20.000

6.1 Setting the units (SET-UNIT)

MEM SET

--SET--
UNIT>
UNIT> POWER: OFF
UNIT> AUTO SENSOR>
UNIT> AUX. SENSOR>
UNIT> PROJECT>
UNIT> CONTRAST(< >): 50
UNIT> TIME/DATE>
UNIT> VERSION 0105

--UNIT--
UNIT>
UNIT> PRESSURE: bar
UNIT> TEMPERATURE: °C
UNIT> FLOW: L/min
UNIT> POWER: kW

Available for selection:
PRESSURE: bar, mbar, psi, MPa, kPa
TEMPERATURE: °C, °F
FLOW: L/min, G/min (US)
POWER: kW, HP (US)

6.2 Auto power off (SET-AUTO POWER)

MEM SET

--SET--
UNIT>
UNIT> AUTO POWER: OFF
UNIT> AUX. SENSOR>
UNIT> PROJECT>
UNIT> CONTRAST(< >): 50
UNIT> TIME/DATE>
UNIT> VERSION 0105

Available for selection:
AUTO POWER: OFF, ON

6.3 Setting auxiliary sensors (SET-AUX. SENSOR)

► Further information is available in the chapter 'Connecting auxiliary sensors'.

ENGLISH

--SET--
UNIT>
UNIT> POWER: OFF
UNIT> AUTO SENSOR>
UNIT> AUX. SENSOR>
UNIT> PROJECT>
UNIT> CONTRAST(< >): 50
UNIT> TIME/DATE>
UNIT> VERSION 0105

--SET--
UNIT>
UNIT> POWER: OFF
UNIT> AUTO SENSOR>
UNIT> AUX. SENSOR>
UNIT> PROJECT>
UNIT> CONTRAST(< >): 50
UNIT> TIME/DATE>
UNIT> VERSION 0105

--TIME/DATE--
UNIT>
UNIT> HOUR: 14
UNIT> MINUTE: 47
UNIT> SECOND: 35
UNIT> DAY: 08
UNIT> MONTH: 04
UNIT> YEAR: 06

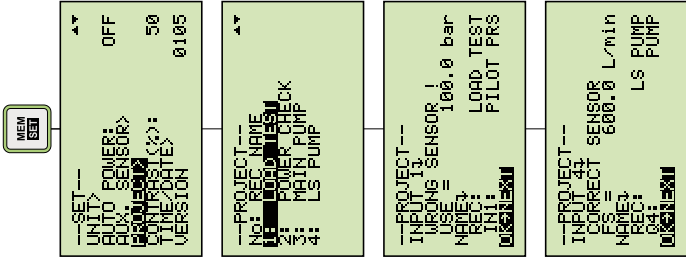
--PROJECT--
UNIT>
UNIT> REC NAME
UNIT> 1: LOAD TEST
UNIT> 2: POWER CHECK
UNIT> 3: MAIN PUMP
UNIT> 4: LS PUMP

--PROJECT--
UNIT>
UNIT> INPUT 1
UNIT> WIDING SENSOR 1
UNIT> NOISE = 100.0 bar
UNIT> NAME
UNIT> NOISE
UNIT> LOAD TEST
UNIT> PILOT PRS
UNIT> DISCONNECT

--PROJECT--
UNIT>
UNIT> INPUT 4
UNIT> CORRECT SENSOR
UNIT> FS = 600.0 L/min
UNIT> NAME3
UNIT> REC: LS PUMP
UNIT> REC: LS PUMP
UNIT> REC: LS PUMP
UNIT> DISCONNECT

6.4 Displaying defined measurement tasks (SET-PROJECT)

Up to five different measurement tasks (PROJECT) can be configured in the PC software. Certain sensors are defined for each input. These definitions can be retrieved in SET-PROJECT.



Input 1



Wrong sensor connected!
Please use measurement range 100 bar.

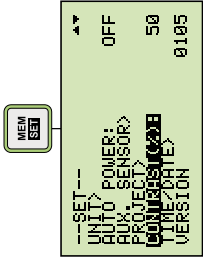
Input 4



Correct sensor connected
FS = 600 L/min

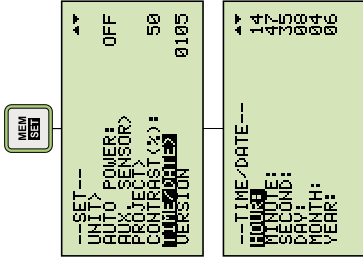
It is only possible to alter this setting using the PC software.

6.5 Setting the contrast (SET-CONTRAST)



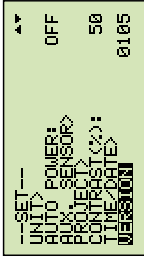
Available for selection:
CONTRAST: 10 .. 100 %

6.6 Setting the time/date (SET-TIME/DATE)



Available for selection:
HOUR: 0 .. 23
MINUTE: 0 .. 59
SECOND: 0 .. 59
DAY: 1 .. 31
MONTH: 1 .. 12
YEAR: 1 .. 99

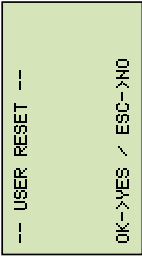
6.7 Displaying the device version (SET-VERSION)



6.8 Factory setting (USER RESET)

Proceed as follows to restore the measuring instrument to its factory-set default settings:

- 1 Turn off the measuring instrument.
- 2 Press and hold down the MEM-SET key.
- 3 Press the ON/OFF key.



- 4 Press OK to confirm USER RESET

ENGLISH

7. Configuring the measured value memory (MEMORY SET)

The following settings will be undertaken:

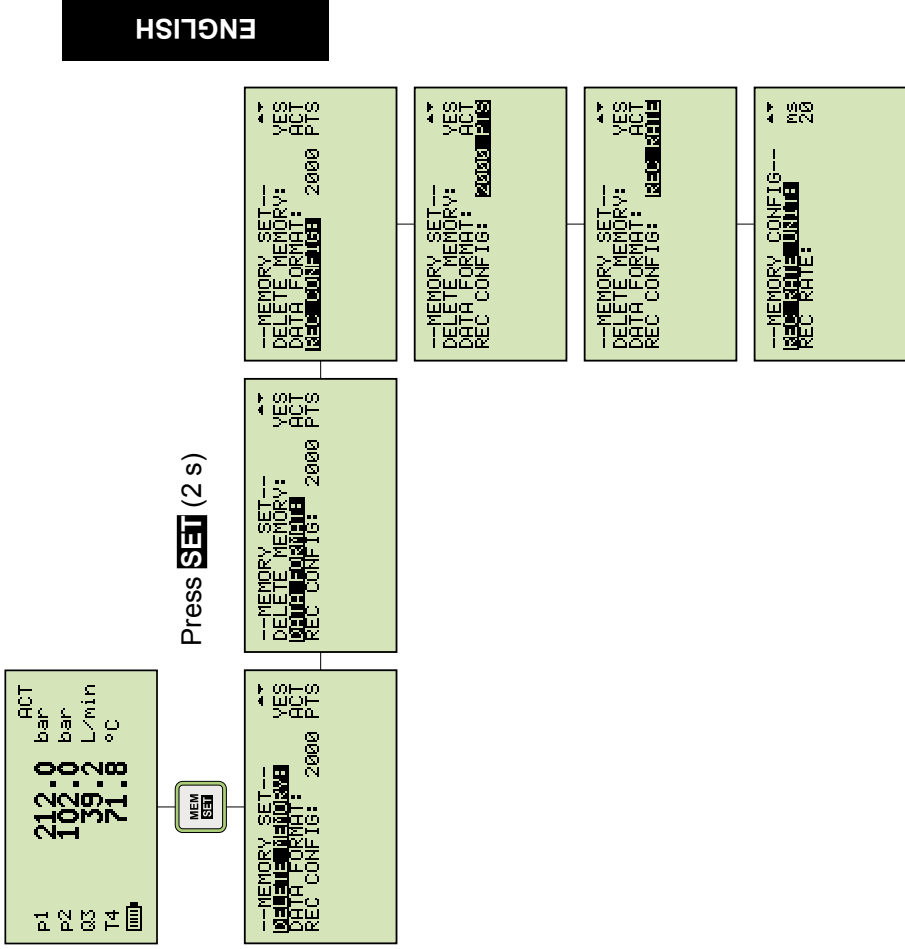
- Delete measured value memory
- Configure data format of the measured values
- Configure recording intervals

Menu	Setting/ pre-selection	Example	Notes
DELETE MEMORY:	YES, NO	YES	Delete the measured value memory
DATA FORMAT:	ACT MIN-MAX	ACT	Data format of the meas- ured values ACT = Save actual values MIN-MAX = Save MIN/MAX values
REC CON- FIG:	REC RATE 2.000 PTS	2 000 PTS	REC RATE = Setting an individual re- cording interval 2.000 PTS = Dividing the recording time in 2 000 recording intervals
REC RATE UNIT:	ms, s, h	ms	Pre-selecting time unit (recording interval)
REC RATE:	Number	20	Setting 20 ms

 When defining ACT values, it is possible that important measure-
ment values will not be saved if the selected recording interval is
too great.

Example:

No dynamic MIN-MAX values are saved when the recording interval is set to 200 milliseconds. Therefore, the setting MIN-MAX is recommended for dynamic measurements (pressure spikes).

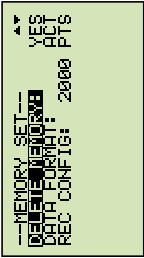


7.1 Deleting measured value memory (MEM-DELETE MEMORY)

MEM SET
press once (briefly).

Available for selection:

DELETE MEMORY: YES/NO

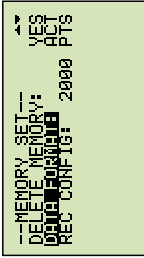


i The measured value memory will be deleted when the OK key is pressed to confirm the action.

7.2 Setting the data format (MEM-DATA FORMAT)

Available for selection:

DATA FORMAT: ACT
MIN/MAX
FAST



i When set to FAST, the recording interval for measuring and storing at IN1 is 0.5 ms.

7.3 Setting the recording format (MEM-REC-CONFIG)

REC CONFIG

Two different formats can be set:

a. Format 2.000 PTS

The measurement curves are saved with a resolution of 2.000 intervals (points).

b. Format REC RATE

The measurement curves are saved at a defined interval.

Example: 20 ms

--MEMORY SET--
DELETE MEMORY: YES
DATA FORMAT: ACT
REC CONFIG: 2000 PTS

--MEMORY SET--
DELETE MEMORY: YES
DATA FORMAT: ACT
REC CONFIG: 2000 PTS

--MEMORY SET--
DELETE MEMORY: YES
DATA FORMAT: ACT
REC CONFIG: REC RATE

--MEMORY CONFIG--
REC RATE: 20

ENGLISH

8. The REC menu

--REC 108 17--
REC NAMES
P1: 123.0 bar
P2: 111.0 bar
Q4: 500.0 L/min
REC 108 17

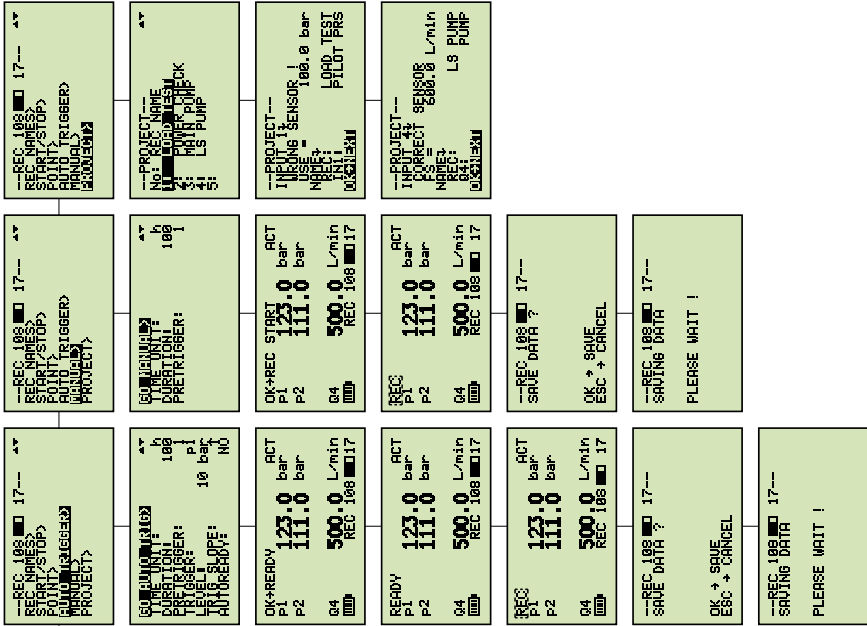
--REC 108 17--
REC NAMES
P1: 123.0 bar
P2: 111.0 bar
Q4: 500.0 L/min
REC 108 17

--REC 108 17--
REC NAMES
P1: 123.0 bar
P2: 111.0 bar
Q4: 500.0 L/min
REC 108 17

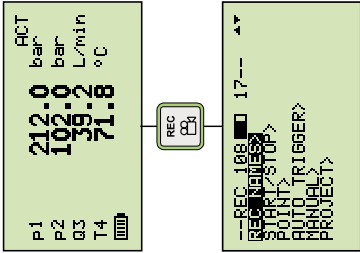
--REC 108 17--
REC NAMES
P1: 123.0 bar
P2: 111.0 bar
Q4: 500.0 L/min
REC 108 17

9. Recording measured values

9.1 Settings for recording measured values (REC)



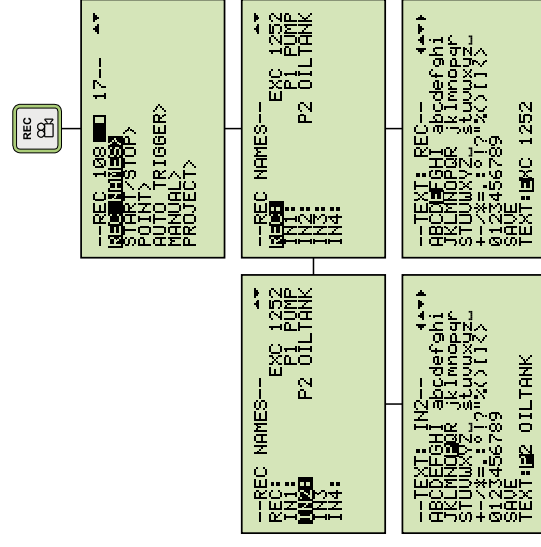
ENGLISH



The following parameters are displayed in the information bar:

REC 108	Number of recorded measured values. In this example there are 108 measurements saved to memory.
17	Memory allocation Number of measured values that can still be recorded. With the current setting/configuration it is possible to save a further 17 measurements.
REC	The REC symbol flashes when measured values are being written to memory.

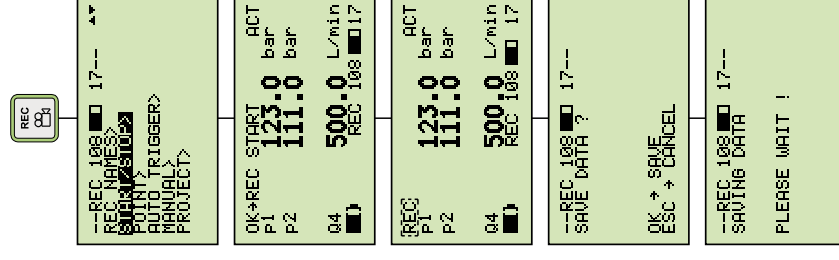
9.2 The REC NAMES setting



Designations (names) for measurements and channels IN1/IN2/IN3/IN4 are defined through the text/numerical input. These settings remain saved in the measuring instrument.

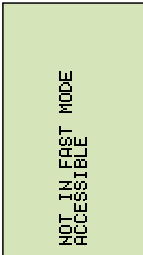
Memory function START/STOP

The user controls the recording of measured values using the START and STOP/ESC keys.



i The data format FAST (recording interval ACT values in 0.5 ms) cannot be used when the device is in the START/STOP mode.

The following message is displayed:

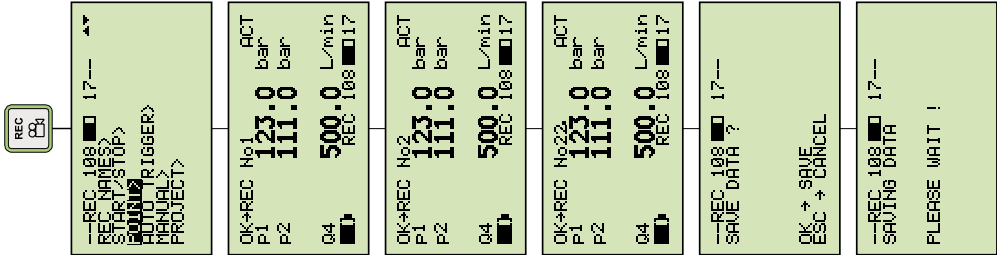


If the measured value memory is full, the following message is displayed:



Memory function POINT

Measurement points representing a given machine sequence (for example, lifting, sinking, operation under load, off-load operation etc.) are saved in a 'point-to-point curve'. In the example shown, the channels p1, p2 and Q4 are connected.



The first data record will be saved; for example, p1, p2 and Q4

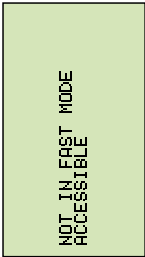
The second data record will be saved; for example, p1, p2 and Q4

The third data record will be saved; for example, p1, p2 and Q4

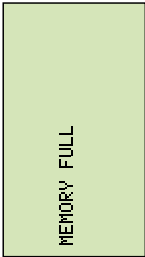
Press the OK key to save the data records. Press the STOP/ESC key to end recording measured values; all data records will be written in the measured value memory.

i The data format FAST (recording interval ACT values in 0.5 ms) cannot be used when the device is in the START/STOP mode.

The following message is displayed:



i If the measured value memory is full, the following message is displayed:



ENGLISH

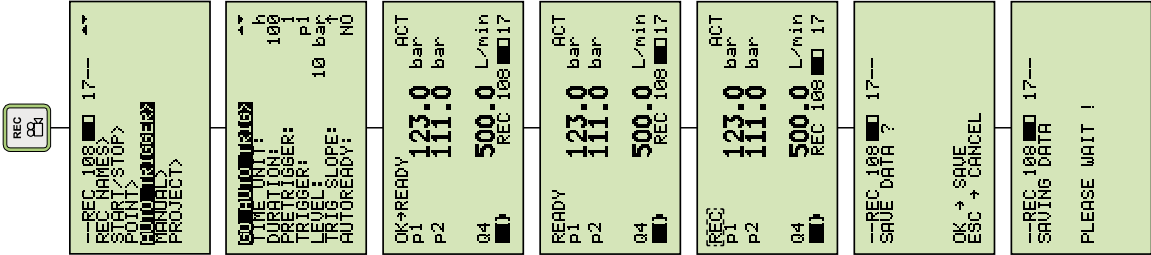
Memory function AUTO TRIGGER

The function Auto Trigger documents the process of recording measured values triggered by a defined start signal (for example, pressure on channel 2 → 125 bar). In response, a sequence of measured values are automatically recorded until the previously set measurement time expires.

Time-dependent functions (for example, making operations or production cycles) are measured when recording measured values.

The following parameters must be set:

Menu	Setting/ pre-selection	Values	Notes
TIME UNIT>	sec, hrs	h	Pre-selected time unit (trigger/pre-trigger)
DURATION>	Number	100	Recording time
PRE TRIGGER>	Number	1	Pre-trigger time (time before the trigger signal)
TRIGGER>	IN	p1	Starting-point measuring channel
LEVEL>	Number	125 bar	Start point value
TRIG SLOPE>	▲ ▼	▲	Ascending or descending edge
AUTO READY>	YES, NO	YES	Recording of measured values is repeated automatically



i If conflicts arise between the recording time and the set recording interval, the following message is displayed:

1. FAST MODE

FIRST MODE:
DURATION CONFLICT !
SET <= ...s

Configuring a longer recording interval

2. REC RATE

SETTING CHANGE
MEMORYRATE = 100ms

Configuring a longer recording interval

i If the measured value memory is full, the following message is displayed:

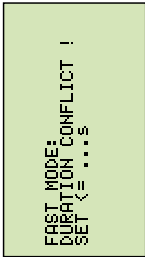
MEMORY FULL

Delete measured value memory or transfer to PC.



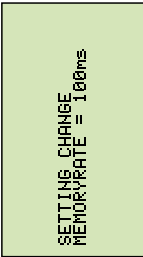
If conflicts arise between the recording time and the set recording interval, the following message is displayed.

1. FAST MODE



Configuring a longer recording interval

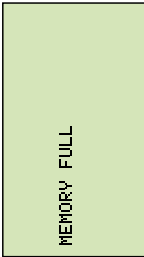
2. REC RATE



Configuring a longer recording interval



If the measured value memory is full, the following message is displayed:



Delete measured value memory or transfer to PC.

Recording measured values with default PROJECT settings

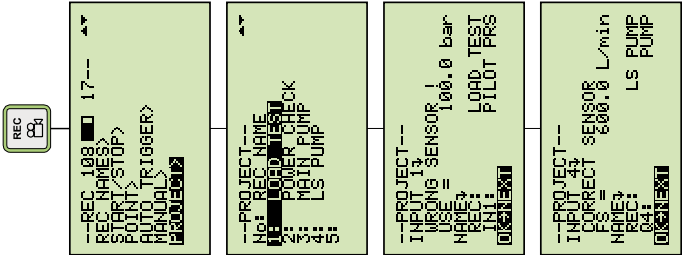
In this setting, measurements are made using a defined sensor configuration. This configuration is defined by the user using the PC software. This avoids false measurements and wrong settings.

The preset parameters are altered in the PC software and transferred to the measuring instrument.

The following parameters can be set:

Menu	Setting/ pre-selection		Notes
REC NAME>	No: 1 . . 5	Load Test	There are max. 5 predefined settings (tests) available for selection.
INPUT>	PILOT PRS		Defined sensors are defined for each channel.
WRONG SENSOR !	USE	150 bar	Warns of wrong sensor. A pressures sensor with the corresponding FS (full scale) must be connected to this channel.
CORRECT SENSOR!	FS	600 L/min	Indicates correct sensor. The next channel can be connected.

When all of the sensors are connected, the respective type of recording (START/STOP, POINT, AUTO TRIGGER, MANUAL) is selected and performed automatically.



ENGLISH



10. Setting and operating via PC
10.1 Connecting to a PC

Measuring instrument, PC and USB cable

- 1 Connect the measuring instrument to the PC (USB cable)
- 2 Launch PC software.

The following screen is displayed:



Once the procedure has been confirmed, the measuring instrument will be initialised and can communicate with the PC.

10.2 Operating/configuring via PC

- All further steps and settings are described in detail in the PC software.
- Online measurement
 - Reading out the measured value memory
 - PROJECT definition
 - Administering and analysing measurement curves

ENGLISH

11. Accessories

Power supply unit 110/240 VAC EUR/US/UK/AUS	SCSN-450
Car adapter cable 12/24 VDC	SCK-318-05-21
Connection cable 3 m 5 m Extension (5 m)	SCK-102-03-02 SCK-102-05-02 SCK-102-05-12
Pressure sensors -1 ... 15 bar 0 ... 60/150/400/600/1.000 bar	SCPT-015-02-02 SCPT-xxx-02-02
Volumetric flow rate sensors -60 ... +60 L/min -150 ... 150 L/min	SCQ-060-0-02 SCQ-150-0-02
Measurement turbines 15/060/150/300/600/750 L/min	SCFT-xxx-02-02
Measurement turbines with load valve 150 L/min 300/600/750 L/min	SCFT-150-DRV SCLV-PTQ-xxx
Volumetric flow meter 15/060/150/300 L/min	SCVF-xxx-00-02
Temperature sensors (125 °C) Screw-in sensor (M10) Hand-held sensor	SCT-150-04-02 SCT-150-0-02
Rotational speed sensor (10 000 RPM)	SCRPM-220
Carry case with foam insert for SCFT-150-DRV Aluminum carry case SCLV-PTQ-300 SCLV-PTQ-600/750	SCC-560 SCC-750 SCC-PTQ-300 SCC-PTQ-600

12. Technical data

Input	Sensor recognition (p/T/Q/h) Connecting auxiliary sensors Plug-in connection, 5-pin push-pull Resolution 12 bit + sign = 4.096 steps
Sampling period	1 ms 0.25 ms FAST MODE (IN1)
Display	LCD 128 x 64 pixels, size 72 x 40 mm Illumination Height of characters 6 mm
Input	Membrane keypad
Interface	USB 2.0 Online speed 20 ms ACT-MIN-MAX
Display functions	Difference; addition; power; volumes ACT; MIN; MAX; FS; TEMP
Measured value memory	Measured value memory: 1 000 000 points Curve memory: 250 000 points Data format: ACT: MIN-MAX FAST (0.25 ms) Memory configuration: interval (e.g. 5 ms) points per channel (2.000)
Environmental conditions	Ambient temperature: 0 .. 50 °C Storage temperature: -25 °C .. 60 °C Temperature error: 0.02 %/°C Relative humidity: <80 % Degree of protection: EN 60529 IP 54 (water splash/oil) Drop test IEC 60068-2-32
CE	DIN/EN 61000-6-2 DIN/EN 61000-6-3
Power supply (external)	11 ... 30 VDC Power supply unit 110/240 VAC - 15 VDC Car adapter 12/24 VDC
Battery	NiMH Charging time 180 minutes Operating time 8 hours

Housing	Polyamide 235 x 106 x 53 mm Weight 530 g
PC software SensoWin	Read out/depict measurement data and analyse on PC Device settings read out/process Load device settings into measuring instrument from library

13. Description of the memory functions

Configuring the measured value memory	
DATA FORMAT	ACT During the recording interval (for example, 50 ms), the current measurement value (ACT) only will be written to the measured value memory.
	MIN-MAX During the recording interval (for example, 50 ms) one MIN and one MAX value will be written to the measured value memory.
REC CONFIG	2 000 PTS The selected recording time is automatically divided into a fixed number of recording intervals per channel. Example: 10 min recording time = 600 s Duration of recording interval = $600\text{ s} \div 2.000 = 300\text{ ms}$
	REC RATE Definition of an individual recording interval (for example, 5 ms). Based on the settings (DATA FORMAT/ REC RATE), the measuring instrument examines if the selected recording time must be extended. Example: Recording time 100 h/conflict recording time
FAST MODE	ACT measured values only are saved at a fixed recording interval of 0.5 ms via IN1. All other inputs (INx) are not in function.

Selecting the memory function: SCPT pressure/temperature sensor

Recording time 60 s					
Memory function	Setting DATA FORMAT	Setting REC CONFIG	Curve memory (points)	Number of measured values/points p (bar) T (°C)	
START/ STOP	ACT MIN-MAX	–	120.000	p (bar) = 15.000 T (°C) = 15.000	
AUTO/ MANUAL TRIGGER	ACT MIN-MAX	2.000 PTS	250.000	p (bar) = 2.000 T (°C) = 60	
		REC RATE (5 ms)	250.000	p (bar) = 12.000 T (°C) = 60	

Important information about the START/STOP mode:	
START/STOP	<p>The settings made under REC CONFIG are not relevant in this mode. The recording time is still unknown when the process of recording measured values begins. For this reason, the recording interval is dynamically optimised and appropriately adapted as the measured values are being recorded. The curve memory can store approx. 120.000 measured values.</p> <p>When SCPT sensors are connected, the measurement values for temperature and pressure are saved at the same recording interval.</p>

ENGLISH

1. Determining the number of recording intervals:			
Channels	Measured variable	Number of measured values	Number of recording intervals
			$120.000 \div \text{measurement values} = \text{number of recording intervals}$
Example ①			
4 (SCPT)	°C	4	$120.000 \div 8 = 15.000$
	bar	4	
	Measured values	8	
Example ②			
2 (SCPT)	°C	2	$120.000 \div 6 = 20.000$
	bar	2	
1 (SCFT)	L/min	1	
1 (SCRPM)	RPM	1	
	Measured values	6	

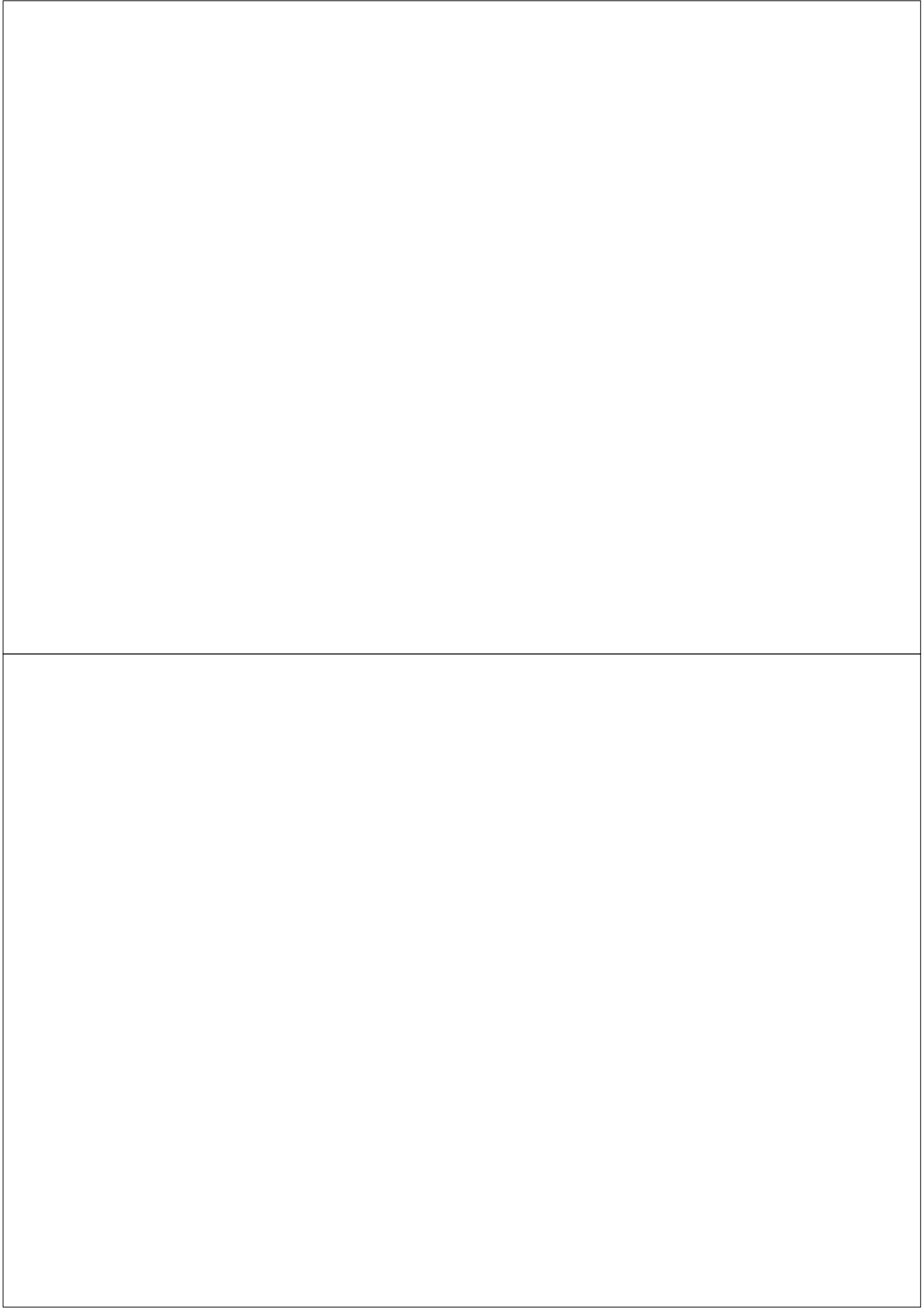
2. Determining the duration of the recording interval:			
Time	Channels	Number of measured values	Duration of recording interval
Example ①			
60 s 60.000 ms	4 (SCPT)	8	$60.000 \div 15.000 = 4$ ms
30 s 30.000 ms	4 (SCPT)	8	$30.000 \div 15.000 = 2$ ms
Example ②			
60 s 60.000 ms	2 (SCPT) 1 (SCFT) 1 (SCRPM)	6	$60.000 \div 20.000 = 3$ ms
40 s 40.000 ms	2 (SCPT) 1 (SCFT) 1 (SCRPM)	6	$40.000 \div 20.000 = 2$ ms

ENGLISH

Important information about the AUTO/MANUAL TRIGGER modes	
AUTO/MANUAL TRIGGER	The settings made under REC CONFIG are relevant in this mode. The recording time is known when the process of recording measured values begins. The curve memory can store 250.000 measured values.
REC CONFIG 2 000 PTS	$DURATION \div 2.000 =$ duration of the recording interval/channel When SCPT sensors are connected, the measured temperature values are saved at a recording interval of 1 second.
REC CONFIG REC RATE	Measured values are recorded at the set interval (REC RATE). When SCPT sensors are connected, the measured temperature values are saved at a recording interval of 1 second.

1. Determining the duration of the recording interval for REC CONFIG 2000 PTS:				
Time	Channels	Measured variable	Number of measurement values	Duration of the recording interval
60 s 60.000 ms	4 (SCPT)	°C bar	4 x 60 4 x 2.000	60.000 ÷ 2.000 = 30 ms
Stored measurement points				
30 s 30.000 ms	4 (SCPT)	°C bar	4 x 30 4 x 2.000	30.000 ÷ 2.000 = 15 ms
Stored measurement points				
60 s 60.000 ms	2 (SCPT) 1 (SCFT) 1 (SCRPM)	°C bar L/min RPM	2 x 60 2 x 2.000 1 x 2.000 1 x 2.000	60.000 ÷ 2.000 = 30 ms
Stored measurement points				
40 s 40.000 ms	2 (SCPT) 1 (SCFT) 1 (SCRPM)	°C bar L/min RPM	2 x 40 2 x 2.000 1 x 2.000 1 x 2.000	40.000 ÷ 2.000 = 20 ms
Stored measurement points				
Stored measurement points			8.080	

2. Determining the number of recording intervals for REC CONFIG/REC RATE 5 ms:				
Time	Channels	Measured variable	Number of measured values	Number of recording intervals
60 s 60.000 ms	4 (SCPT)	°C bar	4 x 60 4 x 12.000	60.000 ÷ 5 = 12.000
Stored measurement points				
30 s 30.000 ms	4 (SCPT)	°C bar	4 x 30 4 x 6.000	30.000 ÷ 5 = 6.000
Stored measurement points				
60 s 60.000 ms	2 (SCPT) 1 (SCFT) 1 (SCRPM)	°C bar L/min RPM	2 x 60 2 x 12.000 1 x 12.000 1 x 12.000	60.000 ÷ 5 = 12.000
Stored measurement points				
40 s 40.000 ms	2 (SCPT) 1 (SCFT) 1 (SCRPM)	°C bar L/min RPM	2 x 40 2 x 8.000 1 x 8.000 1 x 8.000	40.000 ÷ 5 = 8.000
Stored measurement points				
Stored measurement points			32.080	



5.10 PREVENTIVE MAINTENANCE INSTRUCTIONS

1. PRELIMINARIES

Before any maintenance operation :

- Make sure the **safety instructions** are adhered
- Make sure the **adjustment instructions** are known

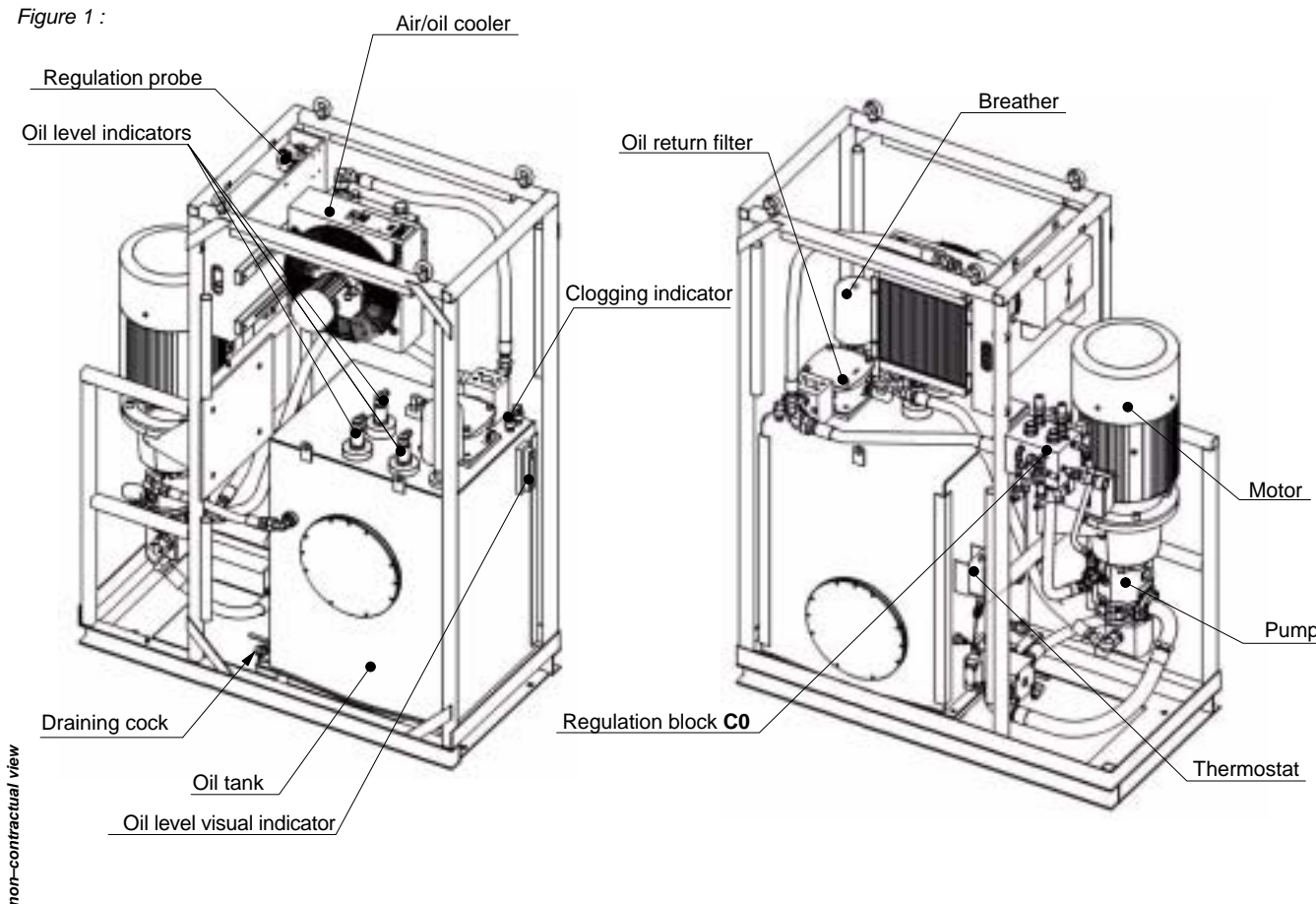
Preventive maintenance is carried out :

- During **production**
- When the machine is **off**
- In the **maintenance** shop (for mobile machines)

Maintenance recommendations

- Avoid opening the circuit as much as possible
- In the event of changing a component, take all the necessary precautions to **prevent dust from entering into the circuit**
- Where mobile machines are concerned, components are changed and start up is carried out **in the maintenance shop**
- Adhere to the maintenance instructions of the lubrication and preventive maintenance instructions.

Figure 1 :



2. PREVENTIVE MAINTENANCE HYDRAULIC UNIT

DESCRIPTION	FREQUENCY				
	Day	1 wk	1 month	6 months	1 year
<u>Inspection from cab or control desk</u>					
– Oil level	*				
– Clogging of filter (Return of oil)	*				
– Oil temperature	*				
– Motor defect	*				
<u>Inspection of machine when OFF</u>					
– Oil level (Visual indicator on tank)	...	*			
– Tightening of VENT SCREW with wrench	...	*			
– Sealing of tank, equipment, pipes	...	*			
– Valves between tank and pumps (inspect sealing and operation of limit switches)	...	*			
– DRY clean tank and containers under hydraulic unit	*	
– Pressure selector, check it is in neutral position (after adjusting operation)	*		
– Elastic mounting between motor and pump	*	
– Sealing of front bearing of pump, mounting end	*	
– Fixing bolts of Motor and Pump					
* visual inspection	*		
* inspection with torque wrench	*
<u>Inspection of machine when ON</u>					
– Progressivity of movements	...	*			
– Speed	...	*			
– Halt (With load)	...	*			
– Vibration	...	*			
– Pulsation of pump	...	*			
– Inspection of pressure during movement using pressure selector	*		
– Inspection of noise level of pumps	...	*			
– Inspection of tripping of thermostats	*		
– Inspect action of limit switches	...	*			
<u>Oil change of tank</u>					
– Change oil	*
(see oil recommended in lubricating instructions)	*
– Change cartridge of return filter (On every change or according to clogging indication on control desk)	*
– Change ventilation filter (on every oil change)	*
– Dry and clean container under hydraulic unit	*
– Check tightening of fittings and equipment fixings	*	

5.11 FILTER RFM BN/HC (HYDAC)

Location	ECL code	Reference	Filtering element
Turret hydraulic equipment	1-10-726-29	RFM BN/HC 661 B M 10	0-02-328-42



Return Line Filter RFM

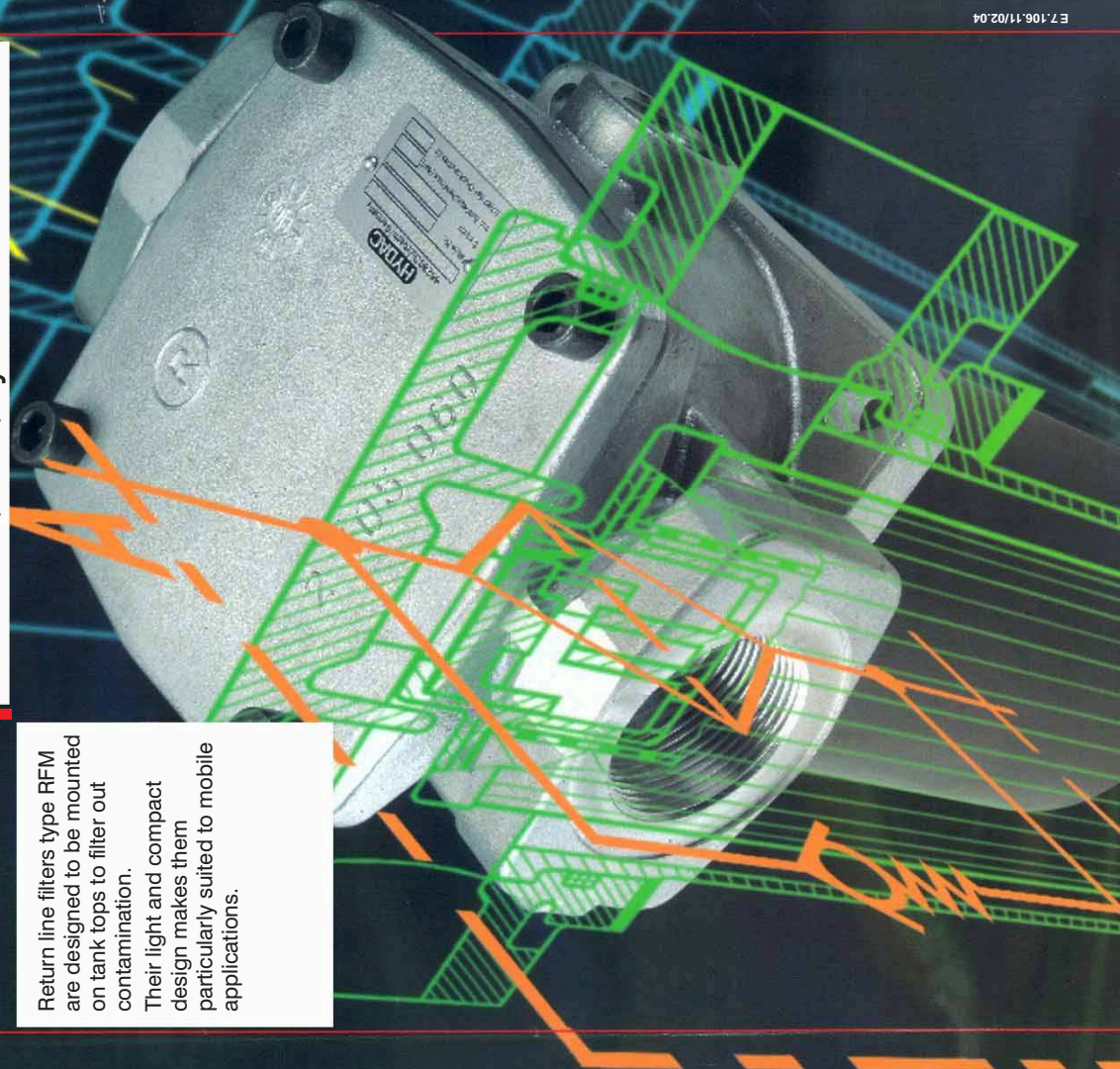
Flow rates up to 850 l/min

Pressure range up to 10 bar

Material:

Aluminium/Steel/Synthetic material

Return line filters type RFM are designed to be mounted on tank tops to filter out contamination. Their light and compact design makes them particularly suited to mobile applications.



1. TECHNICAL SPECIFICATIONS

1.1. FILTER HOUSING

Construction

The return line filter consists of a separate filter head with a suspended filter bowl and bolt-on cover plate.

Connections for clogging indicators are standard.
(Exceptions: sizes 75, 90, 150, 165, 185, 210 and 270 are available with or without indicator connection)

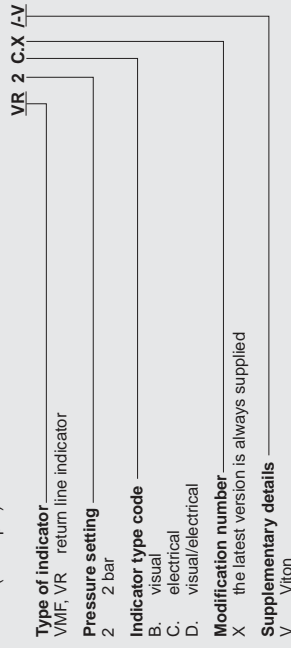
1.2. FILTER ELEMENTS

Original Hydac filter elements guarantee reliable function and protect hydraulic components and systems which are sensitive to contamination from wear and tear. Performance and quality tests according to international standards guarantee reliable operation of the filter.
HYDAC filters are validated and their quality is continuously monitored according to the following standards:

- DIN ISO 2941: Verification of collapse / burst resistance
 - DIN ISO 2942: Verification of fabrication integrity and determination of first bubble point
 - DIN ISO 2943: Verification of material compatibility with fluid
 - ISO 3724: Verification of flow fatigue characteristics
 - ISO 3968: Evaluation of pressure drop versus flow characteristics
 - ISO 16889: Multi-pass method for evaluating filtration performance
- In addition to guaranteeing retention and flow rate characteristics, the filter elements have excellent structural stability. The careful construction and mechanically stable support of the filter media guarantee above-average beta value stability and flow fatigue characteristics of the filter elements.
The filter elements are available with the following collapse/burst stability values:
- | | |
|--------------------------------|--------|
| Betamicon® (BN3HC): | 25 bar |
| Paper (PHC): | 10 bar |
| Wire mesh (WHC): | 30 bar |
| Betamicon®/Aquamicon® (BN/AM): | 10 bar |
| Aquamicon® (AM): | 10 bar |
- For further information on filter elements:
Brochure no.: 7.200.1..

1.3. CLOGGING INDICATOR

(Example)



For further details on clogging indicators, please see brochure no.: 7.050.1..

1.4. SEALS

Choice of Perbunan (= NBR) or Viton (= FPM for HFD fluids).

1.5. SPECIAL MODELS AND ACCESSORIES

- Connections for filling the hydraulic system via the return line filter element (size 330 and over)
- Threaded connection in the outlet
- Tank breather filter in the head, built-in on sizes 75 to 185
- Dipstick for sizes 75, 165, 185 (sizes 90 and 150 on request)

1.6. SPARE PARTS

See Original Spare Parts List and Maintenance Instructions.

1.7. COMPATIBILITY WITH OPERATING FLUIDS

- DIN ISO 2943: Hydraulic oils H to HLPD to DIN 51524
- Lubrication oils to DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils to DIN 51506
- Rapidly biodegradable operating fluids to VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFC and HFD
- Operating fluids with high water content (>50 % water content) on request

For further details on filter elements:
Brochure no.: E 7.200.1..

1.8. WARNING NOTES

- If a pipe extension has been fitted to the outlet of the two-piece filter housing, the pipe must be made of synthetic material or thin-wall aluminium.
- Extensions must be protected by fitting a bulkhead or other means of protection so that no forces can be transmitted to the filter housing or the extension.
- The filter can normally only be used for tank-mounting.

- The filter must be fitted absolutely vertically, or, after consultation with the manufacturer, only within the tolerances specified.
- The filter must not be used as a suction filter.
- Components (e.g. coolers) must not be fitted after the filter.

2. GENERAL

Mounting

Tank-top filter

Temperature range

-30 °C ... +100 °C (short-term -40 °C)

Pressure setting of the return line clogging indicator

$\Delta p_r = 2 \text{ bar} \pm 0.2 \text{ bar}$ (compared with atmospheric pressure)

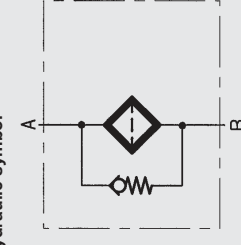
Other pressure settings on request.

Cracking pressure of bypass valve

$\Delta p_o = 3 \text{ bar} \pm 0.5 \text{ bar}$

Other pressure settings on request.

Hydraulic symbol



3. MODEL CODE
(also order example)

3.1. COMPLETE FILTER

Filter type

Filter material of element
BN/HC Betamicron® (BN3HC)

P/HC paper

W/HC stainless steel wire mesh

BN/AM Betamicron®/Aquamicron® (size 330 and over)

AM Aquamicron® (size 330 and over)

Material of housing / Size

A/SUPA 75, 90, 150, 165, 185, 210, 270, 330, 500, 661, 851

Operating pressure

B = 10 bar

Additional second inlet

Type connection filter size

F G 1 1/2 330 500 661 851

K G 1 1/2 330 500 661 851

M SAE DN 40 330 500 661 851

M SAE DN 65 330 500 661 851

Type of connection / Size (1 inlet)

Type connection filter size

B G 1/2 75 90 150 165 185 210 270 330 500 661 851

C G 3/4 75 90 150 165 185 210 270 330 500 661 851

D G 1 75 90 150 165 185 210 270 330 500 661 851

E G 1 1/4 75 90 150 165 185 210 270 330 500 661 851

F G 1 1/2 75 90 150 165 185 210 270 330 500 661 851

K SAE DN 40 75 90 150 165 185 210 270 330 500 661 851

M SAE DN 65 75 90 150 165 185 210 270 330 500 661 851

Z according to customer specification

other connections on request

KIT in-tank mounting kit (all sizes)

SET in-tank mounting set (only on RFM 330 and 500)

S in-tank welding set (only on RFM 75, 165, 185, 330, 500)

Filtration rating in µm

BN3HC : 3, 5, 10, 20

P/HC : 10, 20

W/HC : 25, 50, 100, 200

BN/AM : 3, 10 (size 330 and over)

AM : 40 (size 330 and over)

Type of clogging indicator

Y with plastic blanking plug

W¹⁾ without port for clogging indicator

A without clogging indicator, steel blanking plug in indicator port

B with visual indicator (for sizes 330-851)

C with electrical indicator

D with combined visual/electrical indicator

E/ES with pressure gauge

F with pressure switch (only up to 42 V)

Type code

0 no indicator port, no indicator

1-x see point 3.1.1

Modification number

X the latest version is always supplied

Supplementary details

V FM seals, filter suitable for rapidly biodegradable oils and phosphate esters (HFD-R)

A...B... corresponding pressure setting of the clogging indicator and corresp. cracking pressure of the bypass valve in bar (e.g. A5-B6)

L... LED light with corresponding voltage (24V, 48V, 110V, 220V)

BA 2 light-emitting diodes up to 24 volt

G filling connection (for size 330 and over)

T threaded connection in the outlet (size 330 and over)

G with tank breather filter (only sizes 75, 90, 150, 165 and 185)

Vxxx with pipe extension (where xxx is the final dimension of the extension)

DFxxx spring for RFM... KIT (where xxx is the final dimension of the extension)

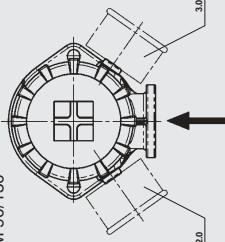
PSxx dipstick for sizes 75, 165, 185 on request

PZxx dipstick for sizes 90, 150 on request

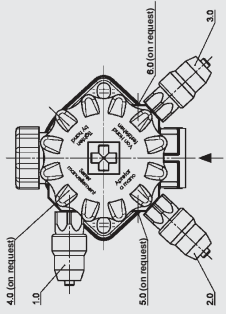
¹⁾ for sizes 75, 90, 150, 165, 185, 210 and 270

²⁾ further tank mounting solutions on request

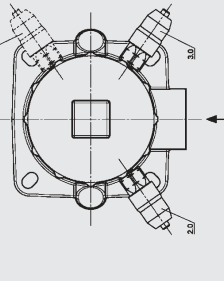
3.1.1 Type code
RFM 90/150



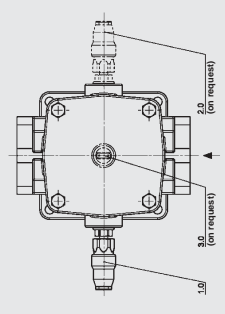
RFM 75/165/185



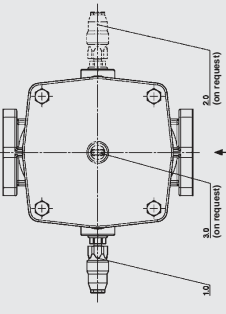
RFM 210/270



RFM 330/500



RFM 661/851



Type code	Mounting position of the clogging indicator	Type of clogging indicator
2.X	Clogging indicator front left, 45° to inlet	VMF...
3.X	Clogging indicator front right, 45° to inlet	VMF...

Type code	Mounting position of the clogging indicator	Type of clogging indicator
1.X	Clogging indicator back left, 90° to inlet	VMF...
2.X	Clogging indicator front left, 45° to inlet	VMF...
3.X	Clogging indicator front right, 45° to inlet	VMF...

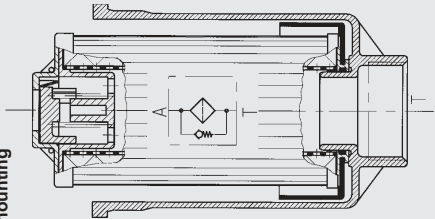
Type code	Mounting position of the clogging indicator	Type of clogging indicator
2.X	Clogging indicator front left, 45° to inlet	VMF...
3.X	Clogging indicator front right, 45° to inlet	VMF...

Type code	Mounting position of the clogging indicator	Type of clogging indicator
1.X	Clogging indicator on left hand side, 90° to inlet	VR...

Type code	Mounting position of the clogging indicator	Type of clogging indicator
1.X	Clogging indicator on left hand side, 90° to inlet	VR...

Note:
Other type codes on request

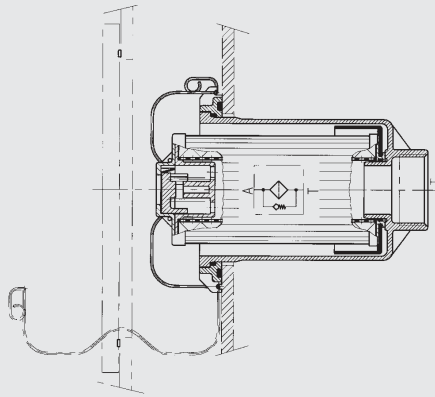
3.1.2 In-tank mounting



RFM BN/HC 165 KIT 10 W 1.0

Type of connection

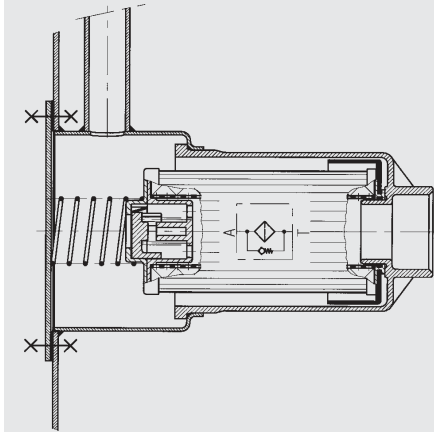
In-tank mounting kit (all sizes)
– bowl with element and O-ring



RFM BN/HC 330 SET 10 W 1.0

Type of connection

In-tank mounting set (only on RFM 330 and 500)
– bowl with element and O-ring, plus adaptor ring



RFM BN/HC 75 S 10 W 1.0

Type of connection

In-tank welding set (only on RFM 75, 165, 185, 330, 500)
– bowl with element and O-ring, plus steel housing

3.2. REPLACEMENT ELEMENT

0500 R 010 BN3HC /-KB

Size

0075, 0090, 0150, 0165, 0185, 0210,
0270, 0330, 0500, 0660, 0850

Type

R

Filtration rating in μm

BN3HC: 3, 5, 10, 20

P/HC: 10, 20

W/HC: 25, 50, 100, 200

BN/AM: 3, 10

AM: 40

Filter material

BN3HC, P/HC, W/HC, BN/AM, AM

Supplementary details

V FPM seals, filter suitable for rapidly biodegradable oils and phosphate ester (HFD-R)

W NBR seals, filter suitable for oil-water emulsions (HFA, HFC) (only for W/HC elements)

B6 with bypass valve (cracking pressure 6 bar)

KB without bypass valve

4. FILTER SPECIFICATIONS

Filter type	Connection	Element size	Weight [kg] incl. element
75	G $\frac{1}{2}$	0075 R...	0.90
	G1		
90	G $\frac{1}{4}$	0090 R...	0.54
150	G $\frac{3}{4}$	0150 R...	0.75
	G $\frac{1}{2}$		
165	G $\frac{1}{2}$	0165 R...	1.10
	G1		
185	G $\frac{1}{2}$	0185 R...	1.14
	G $\frac{3}{4}$		
210	G1	0210 R...	3.10
	G $\frac{1}{4}$		
	G $\frac{1}{2}$		
270	G1	0270 R...	4.30
	G $\frac{1}{4}$		
	G $\frac{1}{2}$		
330	G $\frac{1}{2}$	0330 R...	3.90
	SAE DN 40		
500	G $\frac{1}{2}$	0500 R...	4.50
	SAE DN 40		
661	SAE DN 65	0660 R...	9.00
851	SAE DN 65	0850 R...	10.50

5. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate is the sum of the housing Δp and the element Δp .

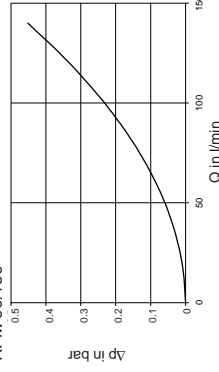
The pressure drop can either be determined with the aid of our Filter Sizing Program, or by using the following graphs.

5.1. Δp -Q HOUSING GRAPHS TO ISO 3968

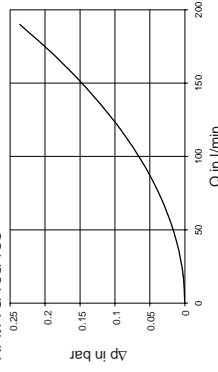
The housing graphs apply to mineral oil with a density of 0.86 kg/dm^3 and a kinematic viscosity of $30 \text{ mm}^2/\text{s}$ for the largest nominal width per size in each case.

For turbulent flows the differential pressure changes proportionally to the density. For laminar flows it changes proportionally to the density and the viscosity.

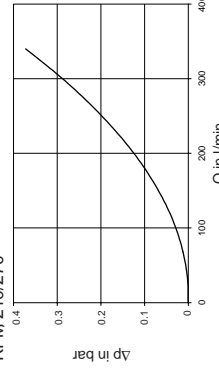
RFM 90/150



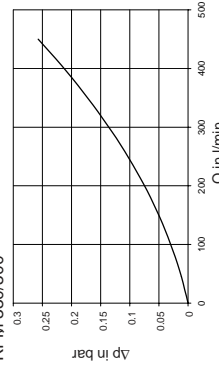
RFM 75/165/185



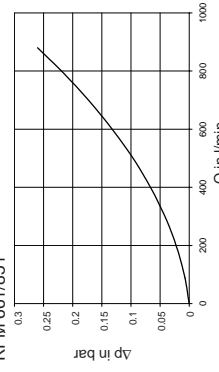
RFM 210/270



RFM 330/500

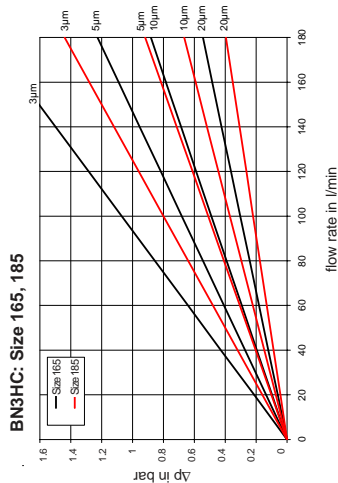
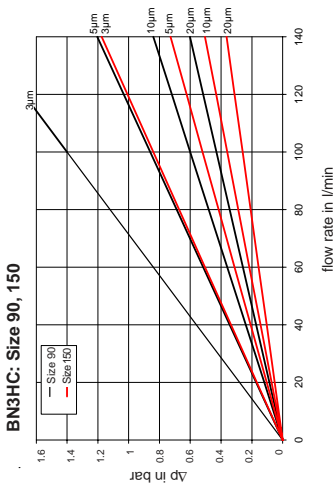
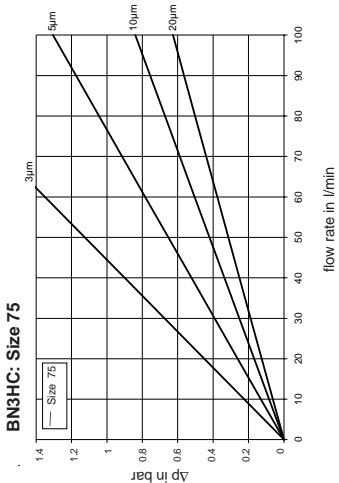


RFM 661/851

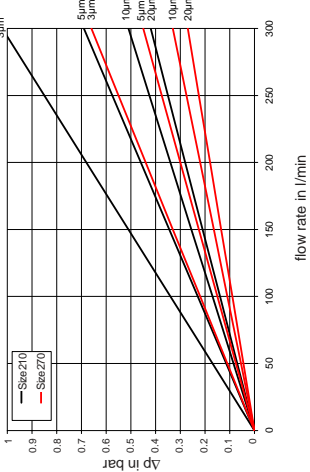


5.2. ΔP-Q GRAPHS - FILTER ELEMENTS

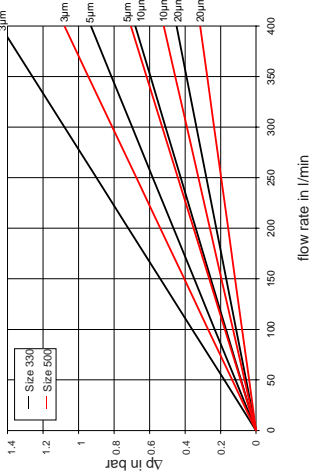
The element graphs apply to mineral oil with a kinematic viscosity of 30 mm²/s.
The pressure drop changes proportionally to the change in viscosity (see Example 5.3.).



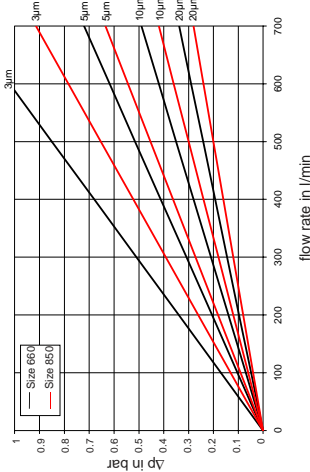
BN3HC: Size 210, 270



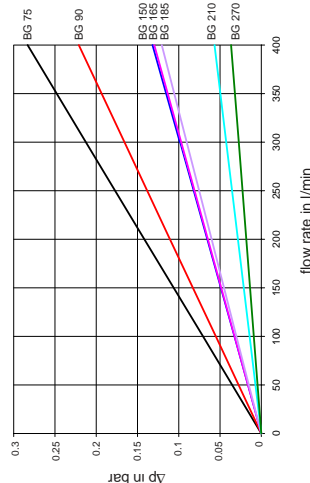
BN3HC: Size 330, 500



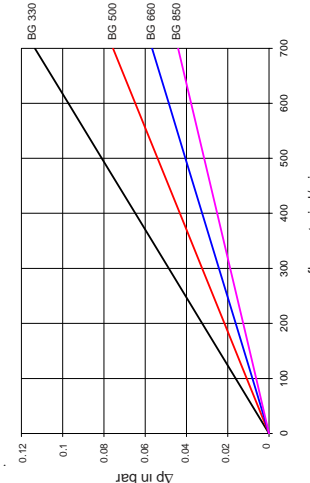
BN3HC: Size 660, 850



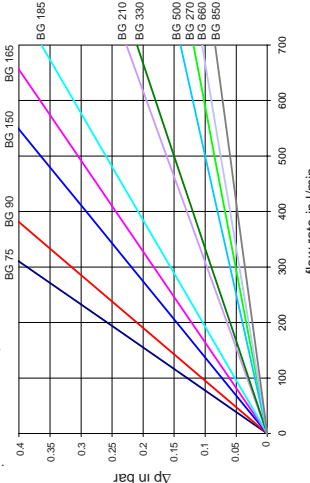
WHC: Size 75-270



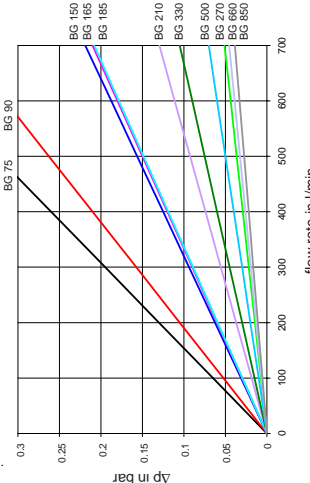
WHC: Size 330-850



P/HC - 10 μm



P/HC - 20 μm



5.3. EXAMPLE

General

$$\Delta p_{\text{total}} = \Delta p_{\text{housing}} + \Delta p_{\text{element}} \cdot \frac{\text{viscosity (mm}^2\text{/s)}}{30 \text{ mm}^2\text{/s}}$$

$\Delta p_{\text{housing}}$ = to be determined from point 5.1.

$\Delta p_{\text{element}}$ = element pressure drop at flow rate Q and viscosity 30 mm²/s according to point 5.2.

Example

System data: RFM 165 with BN3HC element (10 μm);
viscosity = 46 mm²/s (ISO VG 46 at 40 °C);
Q = 50 l/min;

$$\Rightarrow \Delta p_{\text{housing}} = 0.02 \text{ bar (at Q)}$$

$$\Delta p_{\text{element}} = 0.19$$

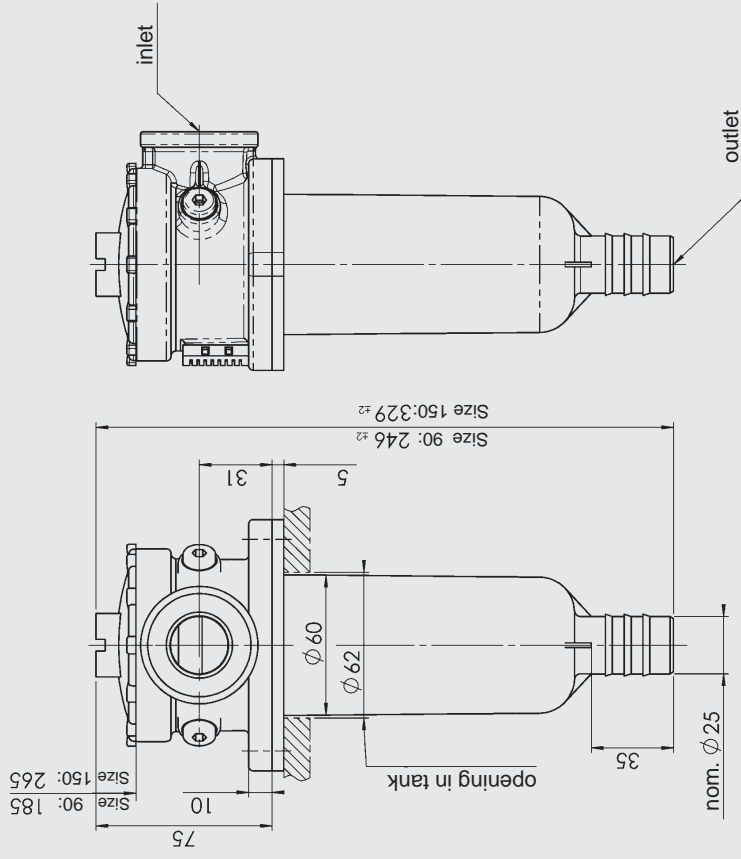
$$\Delta p_{\text{total}} = 0.02 \text{ bar} + 0.19 \cdot \frac{46 \text{ mm}^2\text{/s}}{30 \text{ mm}^2\text{/s}}$$

$$= 0.31 \text{ bar}$$

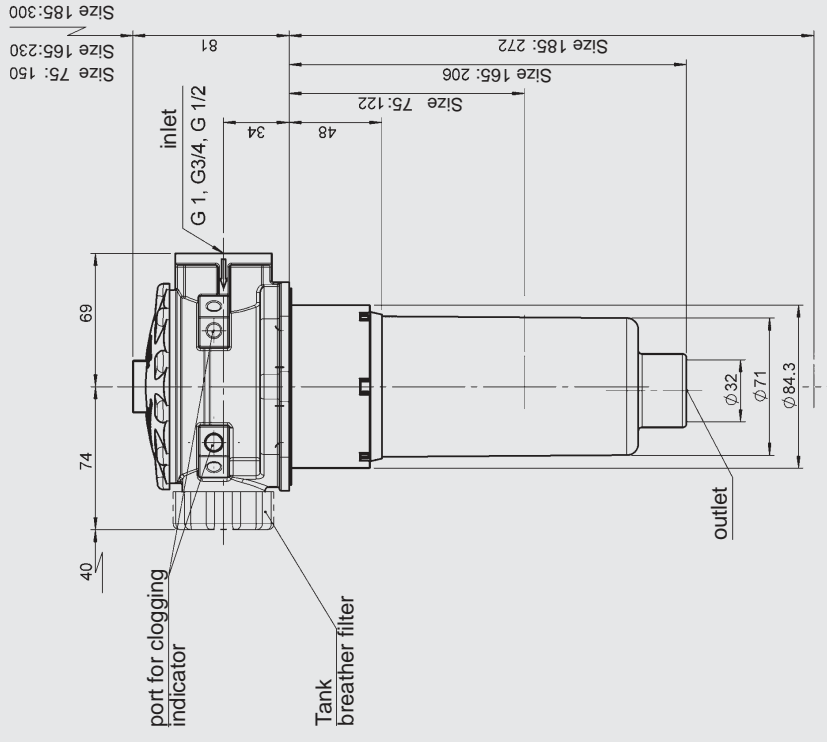
For ease of calculation, our Filter Sizing Program is available and can be ordered via our website www.hydac.com.

6. DIMENSIONS

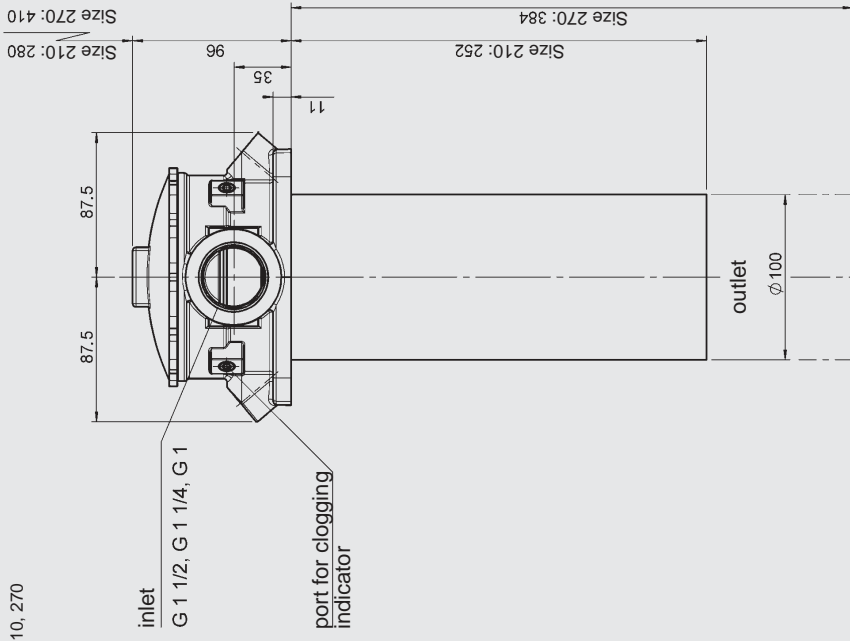
6.1. RFM 90, 150



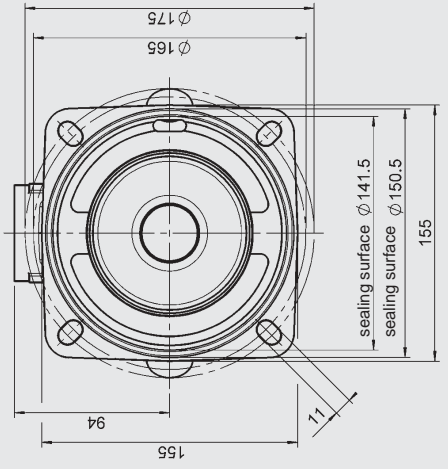
6.2. RFM 75, 165, 185



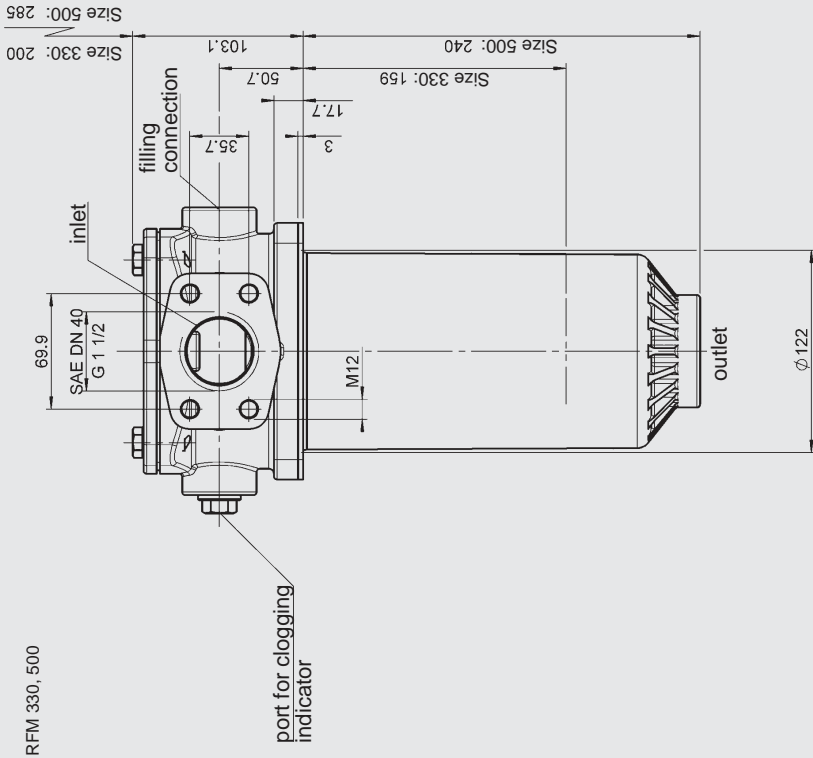
6.3. RFM 210, 270



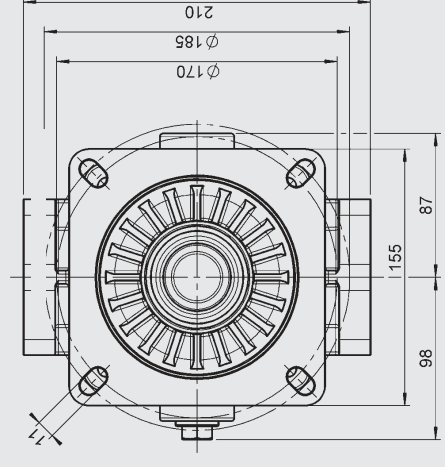
View from below



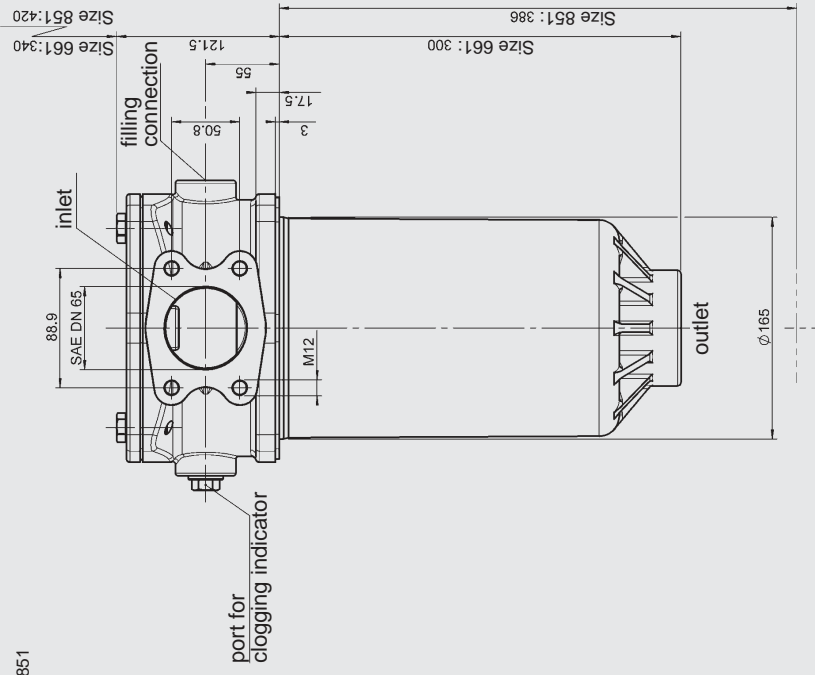
6.4. RFM 330, 500



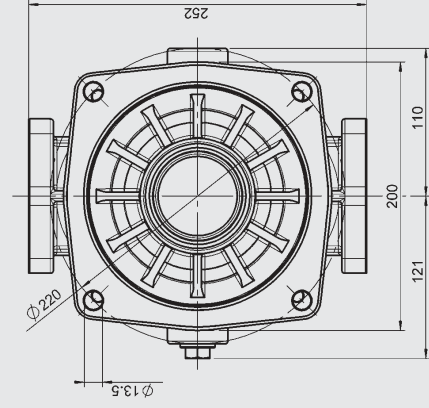
View from below



6.5. RFM 661, 851



View from below

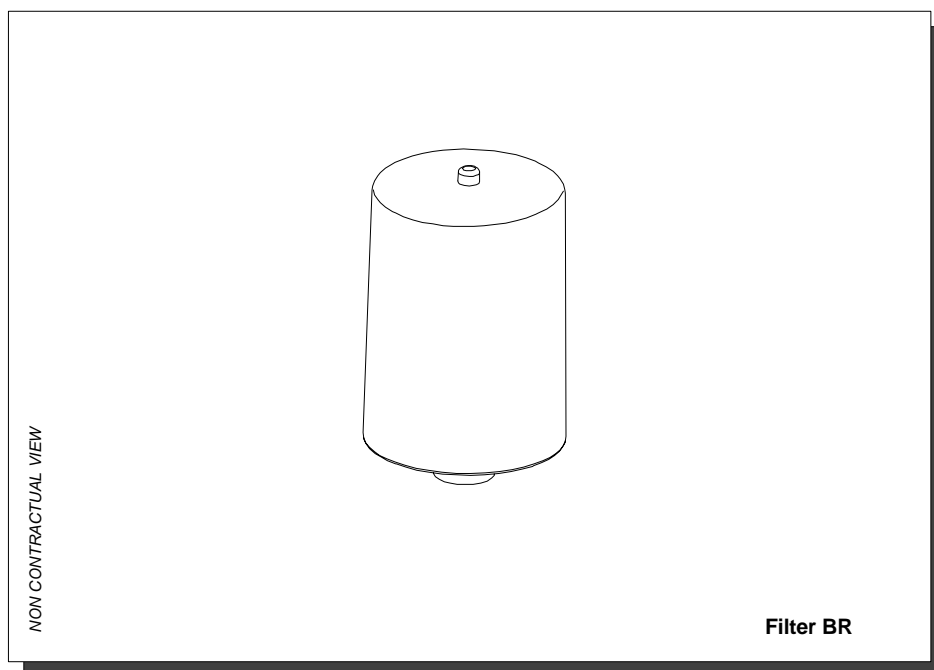


7. NOTE

The information in this brochure relates to the operating conditions and applications described. For applications or operating conditions not described, please contact the relevant technical department. Subject to technical modifications.

5.12 BREATHER BR110 (VICKERS)

Location	ECL code	Reference
Hydraulic Unit	1-10-565-92	BR 110



Vickers®

Filters

Reservoir Vent Filters

Spin-on Air Filters & Adaptors



VICKERS

Rev. 3/98

730

Introduction

Prevent Airborne Ingression

A key element of contamination control is reservoir vent filtration.

Reservoir vents are a common source of both water and particulate contamination from the atmosphere surrounding a hydraulic system.

Fluid contamination can increase:

- Equipment wear
- Cause corrosion
- Reduce fluid performance and life

Hydraulic components have become more complex and operate at higher pressures, flows and temperatures thus making fluid cleanliness a key to longer component life and system reliability. Vickers reservoir vent breathers make it easier to attain higher cleanliness levels, and can extend fluid filter life in the system.

Vickers Offers Hi-Tech Options

Vickers recognizes the variety of atmospheric conditions which hydraulic systems encounter, so we offer a complete line of vent filters to prevent airborne contamination.

Requirement	H2O-Gate	DIRT-Gate	V0211	V0191
Visual Indication*	•	•		
Particle Control	•	•	•	•
Water/Moisture Control	•			
Corrosion Resistant Housing	•	•		

* For systems where a visual indicator cannot be seen for inspection and subsequent action, Vickers recommends service for the vent filter after 500 hours of machine operation.

Contents

H ₂ O-Gate Model Code & Installation	3
H ₂ O-Gate Pressure Drop	3
DIRT-Gate Model Code & Installation	4
DIRT-Gate Pressure Drop	4
V0211 and V0191 Spin-on Elements	5
Spin-on Vent Filter Adaptors	6
Bayonet Adaptors	7
Bayonet Adaptors Pressure Drop	7
System Sampling Frequency Chart	8

DIRT-Gate

Element Model Code
BR210

mm (inches)

DIRT-Gate media is made of a strong graded matrix especially designed for removing airborne contamination. This media is pleated to maximize surface area (high dirt holding capacity) and provides high efficiency (99% at 2 micron) with very low pressure drop.

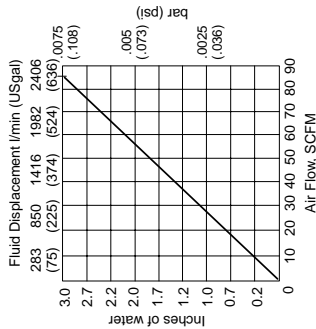
Specifications

Housing Material - ABS Plastic
Temperatures - Up to 121° C (250° F)
Efficiency - 99% at 2 micron

Features & Benefits

- Rugged ABS plastic housing can be exposed to temperatures as high as 121° C (250° F), and is corrosion resistant.
- Visual mechanical indicator, which triggers at 0.07 bar (1 psid) (during exhalation).
- Easy installation. Lightweight design requires only hand tightening.
- Low pressure drop across filter media reduces stress on reservoir and system components.
- Plated steel core prevents filter media distortion.

Pressure Drop



NOTE: Mobile systems may actuate the indicator due to vibrations, in which case the element should be changed after 500 hours of operation.

H₂O-Gate

Element Model Code
BR110

mm (inches)

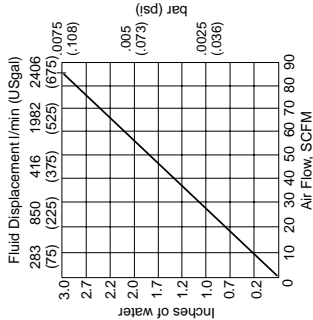
Specifications

Housing Material - ABS Plastic
Temperatures - Up to 121° C (250° F)
Efficiency - 99% at 3 micron

Features & Benefits

- Rugged ABS plastic housing can be exposed to temperatures as high as 121° C (250° F), and is corrosion resistant.
- Visual mechanical indicator, which triggers at ΔP 0.07 bar (1 psid) (during exhalation).
- Easy installation. Lightweight design requires only hand tightening.
- Low pressure drop across filter media reduces stress on reservoir and system components.
- Reversible flow-through media in the H₂O-Gate allows moisture to exit while filter regenerates its capacity to prevent moisture ingress.
- Plated steel core prevents filter media distortion.

Pressure Drop



Low pressure drop across media.

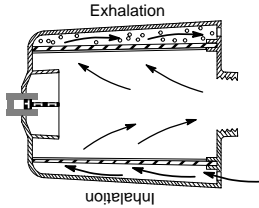
The ΔP indicator triggers at ΔP 0.07 bar (1 psid) (during exhalation).

Highly effective

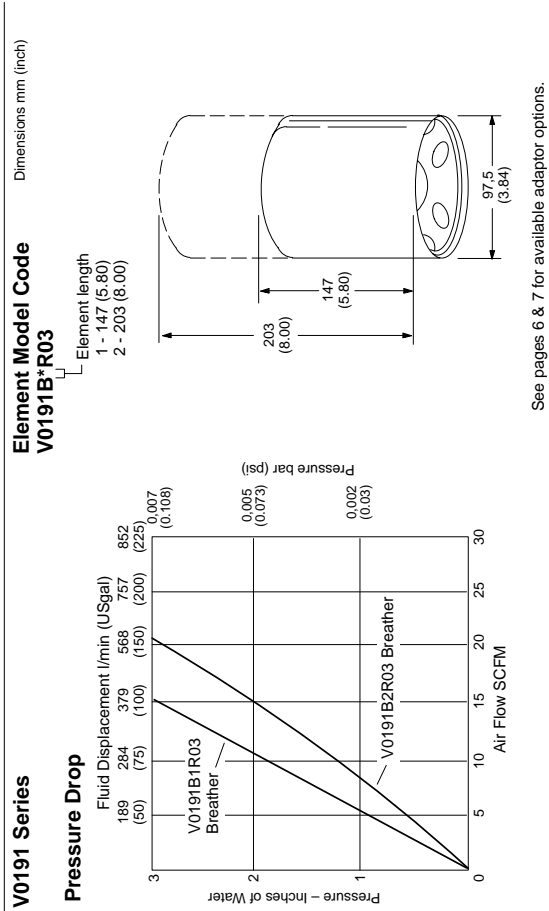
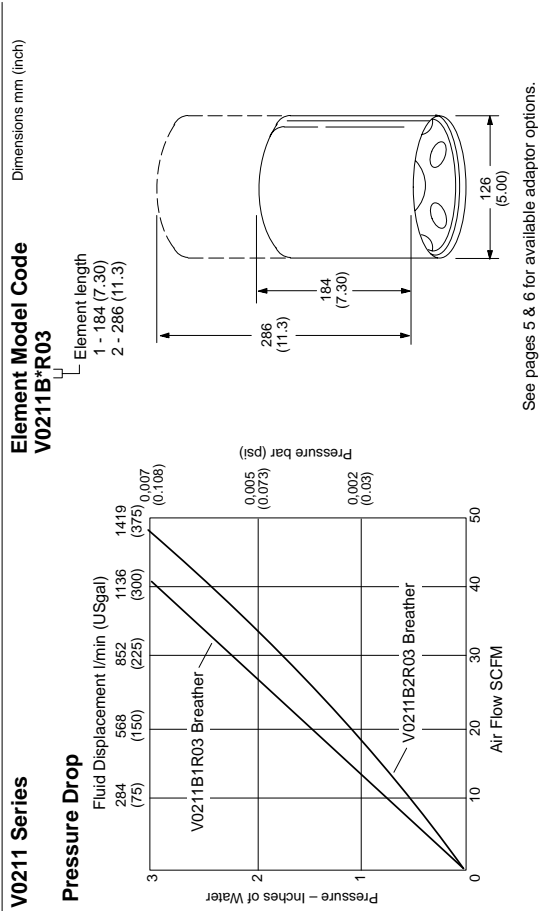
In an operating system, the H₂O-Gate vent breather creates a moisture barrier when there is a 2° C (5° F) degree difference between reservoir and ambient temperature and when there is a 10% exchange of air volume above the fluid.

Performs as a gate.

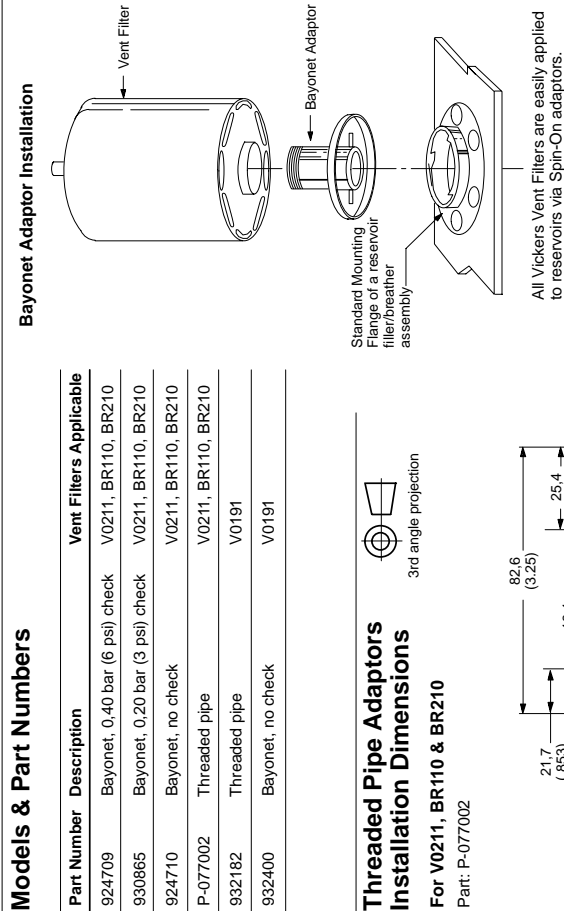
During the "inhalation" cycle, the H₂O-Gate proprietary media blocks the water vapor from entering the reservoir. During the "exhalation" cycle, the media allows the moisture in the reservoir air to exit. The moisture is blown off the media by the exiting air, restoring the media's water barrier capacity. The moisture barrier mechanism is affected by the amount of exposure to moisture. The reservoir air is saturated at a low relative humidity, and more importantly, at a lower dew point temperature than the ambient temperature.



V0211 and V0191 Spin-on Elements



Spin-On Vent Filter Adaptors



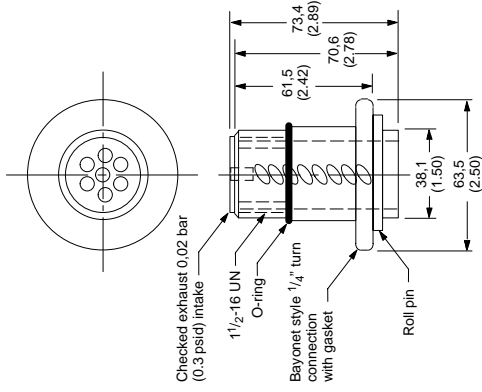
Bayonet Adaptors

For V0211, BR110 & BR210

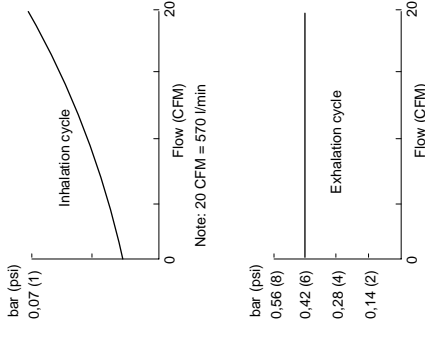
W/Pre-vent
Part: 924709 0.40 bar (6 psid)
Part: 930865 0.20 bar (3 psid)



3rd angle projection



Bayonet Adapter with 0.4 bar (6 psid) Pressure Vent

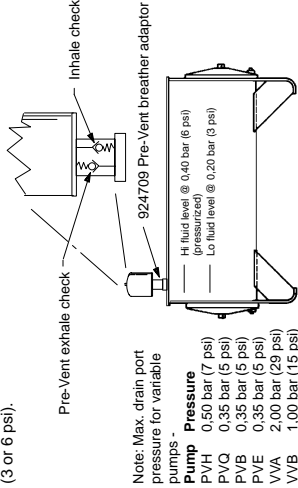


Pre-Vent Option

In a system where the fluid level drops and rises with cylinder actuation, the Pre-Vent feature minimizes the amount of air exchange through the vent filter.

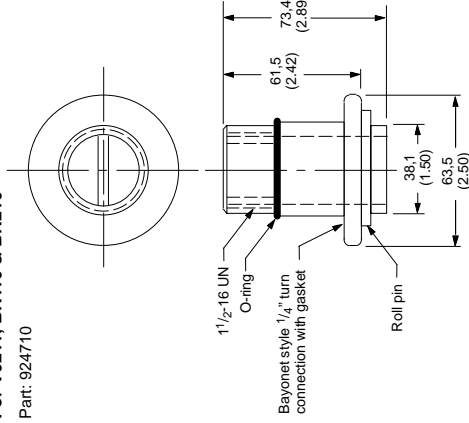
As the oil level drops, air enters the reservoir and is cleaned as it passes through the vent filter. As the oil level begins to rise, the pressure-vent stops the air from escaping the reservoir, and the tank becomes pressurized up to a maximum of the pressure vent setting (either 0.20 bar or 0.40 bar (3 or 6 psi)). The next time the system cycles, and the oil level drops, the air inside the reservoir will expand to make up the difference in volume.

CAUTION: The reservoir tank and system must be designed to withstand a pressure of either 0.20 bar or 0.40 bar (3 or 6 psi).



For V0211, BR110 & BR210

Part: 924710



Vickers® Recommended System Sampling Frequency Chart

Systems with target cleanliness 17/15/12 or lower

System Pressure	< 140 bar (2000 psi)	140 - 210 bar (2000 - 3000 psi)	> 210 bar (3000 psi)
8 hours or less operation per day	4 months	3 months	3 months
Over 8 hours of operation per day	3 months	2 months	2 months

Systems with target cleanliness 18/16/13 or higher

System Pressure	< 140 bar (2000 psi)	140 - 210 bar (2000 - 3000 psi)	> 210 bar (3000 psi)
8 hours or less operation per day	6 months	4 months	4 months
Over 8 hours of operation per day	4 months	3 months	2 months

Initial commissioning or major rebuild

Large system (2000 liters (530 USgal) or more) and systems with servovalves

- Sample fluid before start-up
- Sample fluid during first day running
- Sample fluid after one week
- Sample fluid after one month operation

Other systems

- Sample during first day running
- Sample after one month operation

Systems in distress or immediately after a maintenance event

(i.e. increased heat, erratic operation, unusual sound etc.)

- Immediate

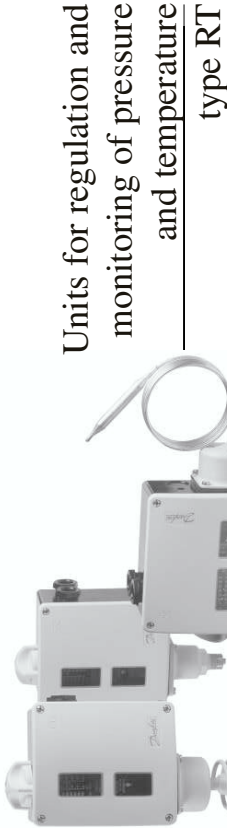
5.13 THERMOSTAT RT 107 (DANFOSS)

Location	ECL code	Reference
Hydraulic Unit	0-00-242-02	RT 107 / 017-513766



Units for regulation and monitoring of pressure and temperature, type RT

Pressure controls type RT					Further information	
Range p _a bar	30 bar	25	20	Type		
-1				RT 121	See contents page 3	
0				RT 113		
0.1				RT 112		
0.2				RT 110		
-0.8				RT 1.1A		
0.2				RT 200		
1				RT 116		
4				RT 5, 5A		
10				RT 117		
0.1				RT 112 W		
0				RT 33B, RT 35 W		
1				RT 30 AW/ABAS		
1				RT 116W		
2				RT 31 W/B/S		
5				RT 19 W/B/S		
5				RT 32 W/B/S		
-0.8				RT 1AL	See contents page 15	
0.2				RT 110L		
0.2				RT 200L		
4				RT 5AL		
10				RT 117L		
-1				RT 266AL		
-1				RT 263AL		
-1				RT 262AL/A		
-1				RT 260AL/A		
-1				RT 260A		
-1				RT 265A		
Thermostats type RT						
Thermostats with differential pressure controls						See contents page 15
$\Delta p = 0.0.9$ bar						
$\Delta p = 0.1.1$ bar						
$\Delta p = 0.1.1.5$ bar						
$\Delta p = 0.5.4$ bar						
$\Delta p = 0.5.6$ bar						
$\Delta p = 1.6$ bar						
Pressure controls with adjustable neutral zone						
Pressure controls for steam plant approved by VdI 22						
Standard pressure controls						
Thermostats with room sensors, duct sensor and capillary tube sensor						
Thermostats with adjustable neutral zone						
Differential thermostats						
Thermostats with differential pressure controls						
Thermostats with adjustable neutral zone						
Differential thermostats						

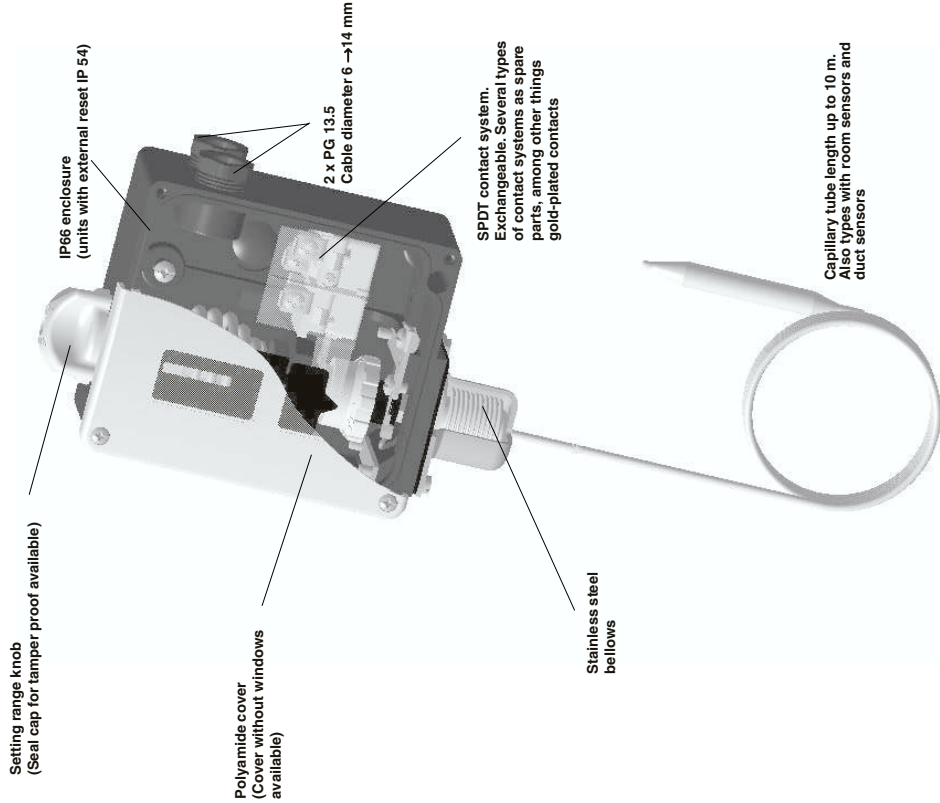


Thermostats, type RT

Contents	
	Page
Survey of types, temperature ranges	3
Introduction	15
Technical data and code nos., all types	23
Nonograms	16-17
Technical data	18-19
Approvals	20
Dimensions and weight	26
Choice of suitable sensor pocket	21

Introduction

A thermostat is a temperature-controlled switch. The position of the contacts depends on the temperature of the sensor and the set scale value.



Thermostats, type RT




Technical data and code nos.

When ordering, please state type and code number.

Types of charge
A: Vapour charge - sensor must not be the warmest part.
B: Adsorption charge
C: Partial charge - the sensor must not be the coldest part

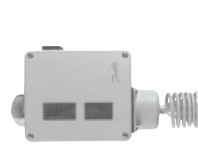
Preferred charge

Thermostats with cylindrical remote sensor

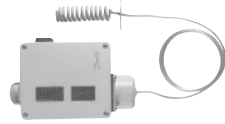
Setting range °C	Adjustable differential range ¹⁾		Max. sensor temp. °C	Type - sensor charge	Capillary tube length m	Code nos.			Type
	at lowest range setting °C	at highest range setting °C							
-60 -25	1.7 - 7	1 - 3	150	A	2	017-5077			RT 10
-45 -15	2.2 - 10	1 - 4.5	150	A	2	017-5066			RT 9
-30 - 0	1.5 - 6	1 - 3	150	A	2	017-5097			RT 13
-25 -15	2.8 - 10	1 - 4	150	A	5	017-5014			RT 3
-25 -15	2.8 - 10	1 - 4	150	A	5	017-5016			RT 3
-25 -15	2.8 - 10	1 - 4	150	A	8	017-5017			RT 3
-25 -15	5 - 18	6 - 20	150	B	2	017-5008			RT 2
-25 -15	2 - 10	2.5 - 14	150	B	2	017-5053			RT 7
-25 -15	2 - 10	2.5 - 14	150	B	5	017-5055			RT 7
-25 -15	2 - 10	2.5 - 14	150	B	8	017-5056			RT 7
-20 -12	1.5 - 7	1.5 - 7	145	B	2	017-5063			RT 12
-5 -10	1 - 3.5	1 - 3	65	B	2	017-5089			RT 8
-5 -30	2 - 8	2 - 10	150	B	2	017-5099			RT 14
-5 -30	2 - 8	2 - 10	150	B	3	017-5100			RT 14
-5 -30	2 - 8	2 - 10	150	B	5	017-5101			RT 14
-5 -30	2 - 8	2 - 10	150	B	8	017-5102			RT 14
-5 -30	2 - 8	2 - 10	150	B	10	017-5103			RT 14
-5 -50	2 - 9	3 - 19	150	B	2	017-5180			RT 26
5 -22	1.1 - 3	1 - 3	85	B	2	017-5278			RT 23
8 -32	1.6 - 8	1.6 - 8	150	B	2	017-5115			RT 15
25 -90	2.4 - 10	3.5 - 20	300	B	2	017-5003	017-5004	017-5005	RT 101
25 -90	2.4 - 10	3.5 - 20	300	B	3	017-5006			RT 101
25 -90	2.4 - 10	3.5 - 20	300	B	5	017-5022	017-5023		RT 101
25 -90	2.4 - 10	3.5 - 20	300	B	8	017-5024			RT 101
25 -90	2.4 - 10	3.5 - 20	300	B	10	017-5025			RT 101
20 -90	4 - 20	2 - 7	120	C	2	017-5048			RT 106
20 -90	4 - 20	2 - 7	120	C	3			017-5049	RT 106
20 -90	4 - 20	2 - 7	120	C	5			017-5051	RT 106
20 -90	4 - 20	2 - 7	120	C	8				RT 106
30 -140	5 - 20	4 - 14	220	B	2	017-5060			RT 108
70 -150	6 - 25	1.8 - 8	215	C	2	017-5135	017-5136	017-5137	RT 107
70 -150	6 - 25	1.8 - 8	215	C	3	017-5139			RT 107
70 -150	6 - 25	1.8 - 8	215	C	5	017-5140	017-5141		RT 107
70 -150	6 - 25	1.8 - 8	215	C	8	017-5144			RT 107
70 -150	6 - 25	1.8 - 8	215	C	10	017-5145			RT 107
120 -215	7 - 30	1.8 - 9	260	C	2	017-5205 ¹⁾	017-5211 ¹⁾		RT 120
120 -215	7 - 30	1.8 - 9	260	C	5	017-5206 ¹⁾			RT 120
120 -215	7 - 30	1.8 - 9	260	C	8	017-5207 ¹⁾			RT 120
120 -215	7 - 30	1.8 - 9	260	C	2	017-5208	017-5214 ²⁾		RT 120
120 -215	7 - 30	1.8 - 9	260	C	5	017-5209			RT 120
150 -250	6.5 - 30	1.8 - 9	300	C	2	017-5220	017-5224		RT 123
150 -250	6.5 - 30	1.8 - 9	300	C	5	017-5222			RT 123
200 -300	5 - 25	2.5 - 10	350	C	2	017-5227	017-5231		RT 124
200 -300	5 - 25	2.5 - 10	350	C	5	017-5229			RT 124

¹⁾ See also pages 18-19.
²⁾ Thermostat filled with neon lamp connected to terminal 4.
³⁾ Thermostat with tamper-proof seal cap.
⁴⁾ Thermostat with max. reset has fixed differential corresponding to min. setting differential.
⁵⁾ Full scale thermostat.

Thermostats, type RT



Thermostat type RT 115 with room sensor



Thermostat type RT 140 with duct sensor



Neutral zone thermostat type RT 16L with room sensor



Differential thermostat type RT 270

Thermostats with room sensor, duct sensor and capillary tube sensor

Setting range °C	Adjustable differential range*)		Max. sensor temp. °C	Type of charge	Capillary tube length m	Sensor type (*) Figure	Code no.	Type
	at lowest range setting °C	at highest range setting °C						
-50-15	22-7	1.5-5	100	A	-	1	017-5117	RT 17
-30-0	1.5-6	1-3	66	A	-	1	017-5083	RT 11
-25-15	2-10	2-12	100	B	-	1	017-5118	RT 34
-5-30	1.5-7	1.2-4	75	A	-	1	017-5036	RT 4
-5-30	1.5-7	1.2-4	75	A	-	1	017-5037)	RT 4
10-35	§)	§)	92	B	-	1	017-5197)	RT 115
10-35	§)	§)	92	B	-	1	017-5198)	RT 115
10-45	1.3-7	1-5	100	A	-	1	017-5155	RT 103
15-45	1.8-8	2.5-11	240	B	2	2	017-5236	RT 140
40-80	1.9-9	2.5-17	250	B	2	2	017-5241	RT 141
25-90	2.4-10	3.5-20	300	B	2	3	017-5147	RT 102

- ^{*)} See also pages 18-19
^{**)} See also fig. 1-5
^{§)} Belows with built-in heating element which reduces the thermal differential (220V)
^{§)} Can be connected to 220 V and 380 V
^{§)} Can be connected to 220 V
^{§)} Thermostat with max. reset
^{§)} Special thermostat for ventilation plant

Thermostats with adjustable neutral zone

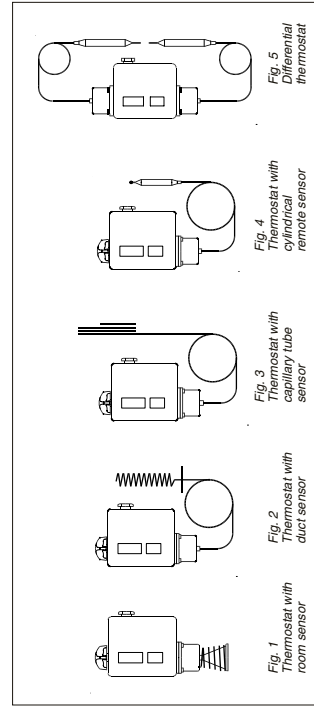
Setting range	Mechanical differential	Adjustable neutral zone		Max. sensor temp.	Type of charge	Capillary tube length	Sensor type*)	Code no.	Type
		at lowest setting	at highest setting						
-20 - 12	1.5	1.5 - 4.4	1.5 - 4.9	145	B	2	4	017L0030	RT 8L
-5 - 30	1.5	1.5 - 5	1.5 - 5	150	B	2	4	017L0034	RT 14L
0 - 38	1.5 / 0.7	1.5 - 5	0.7 - 1.9	100	A	-	1	017L0024	RT 16L
15 - 45	1.8 / 2	1.8 - 4.5	2 - 5	240	B	2	2	017L0031	RT 140L
25 - 90	2.5 / 3.5	2.5 - 7	3.5 - 12.5	300	B	2	4	017L0062	RT 101L

^{*)} See fig. 1-5

Differential thermostats

Setting range (diff. temp.) °C	Mechanical differential °C	Operating range (LT element) °C	Max. sensor temp. °C	Type of charge	Capillary tube length m	Sensor type ^{*) Figure}	Code no.	Type
0-20	3	20 to 100	200	B	2 x 10	5	017D0044	RT 271

^{*)} See fig. 1-5

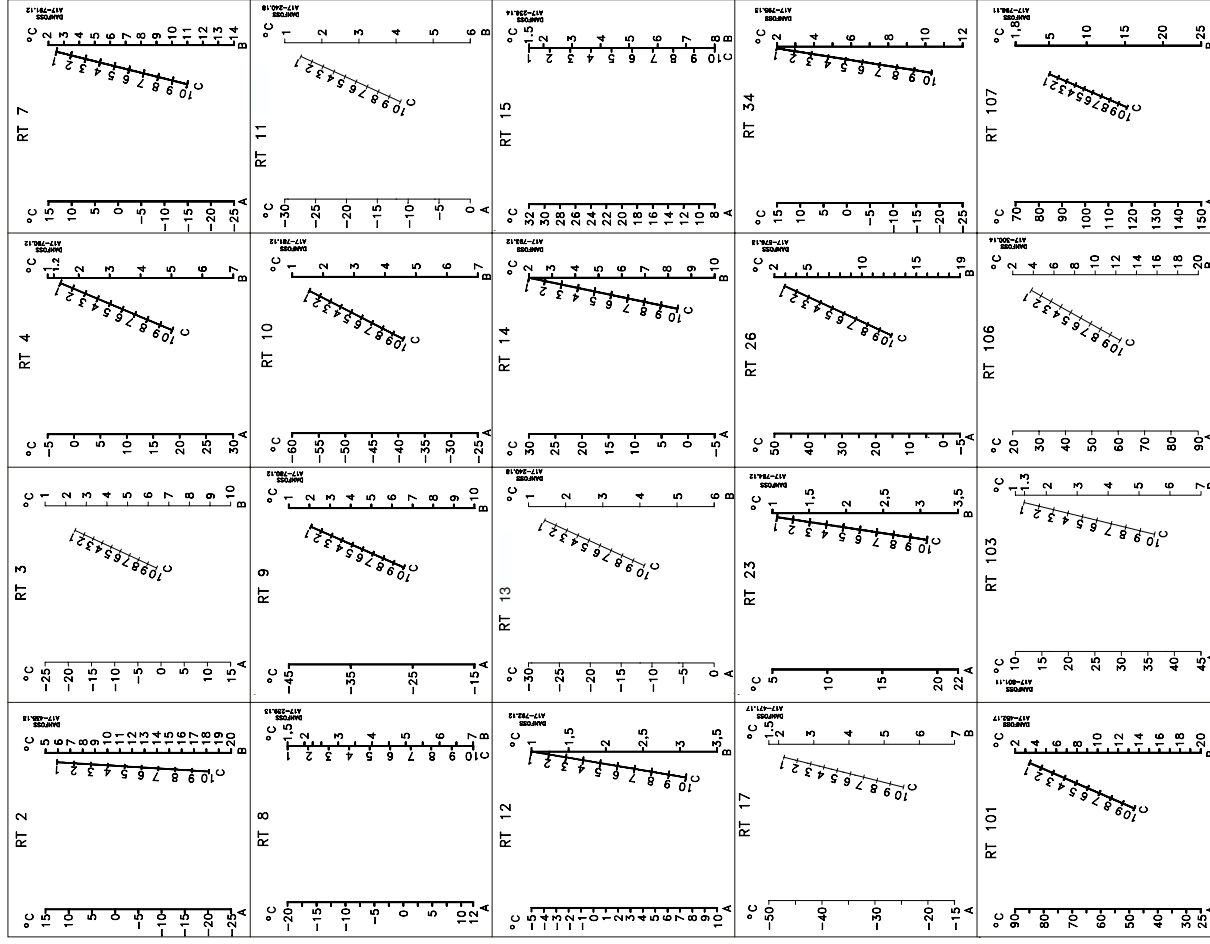


Differential thermostat type RT 270

Thermostats, type RT

Nomograms for obtained differentials

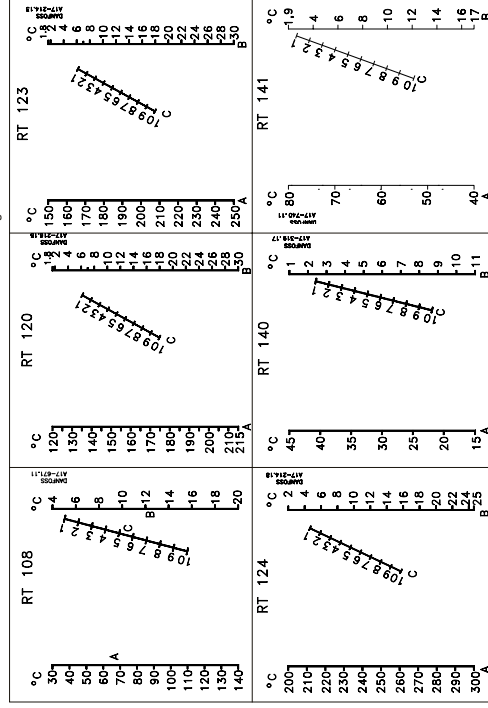
- A = Range setting
 B = Obtained differential
 C = Differential setting



Thermostats, type RT

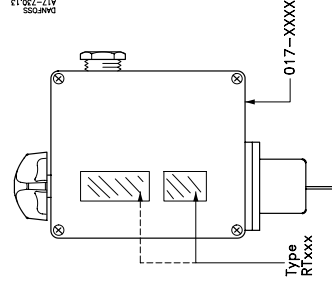
Thermostats, type RT

Nomograms for obtained differentials

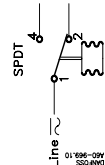
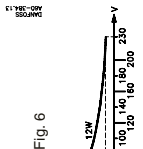


Identification

The type designation of the units is given on the setting scale. The code no. is stamped on the bottom of the thermostat housing



Technical data

Designation Ambient temperature Contact system	RT thermostats -50 to 70°C. See remarks on charge types page 16 	Single-pole changeover switch (SPDT) Alternating current: AC-1: 10A, 400 V AC-3: 4A, 400 V AC-15: 5A, 400 V Direct current: DC-13: 12 W, 230 V (see fig. 6)	
Contact load	Special contact systems Cable entry Enclosure	Contact material: AgCdO	See accessories page 28, 29 2 PG 13.5 for 6 - 14 mm diameter cable IP66 acc. to IEC 529 and EN 60529. Units with external reset IP54. Thermostat housing is made of bakelite acc. to DIN 53470, while the cover is made of polymid.

Approvals

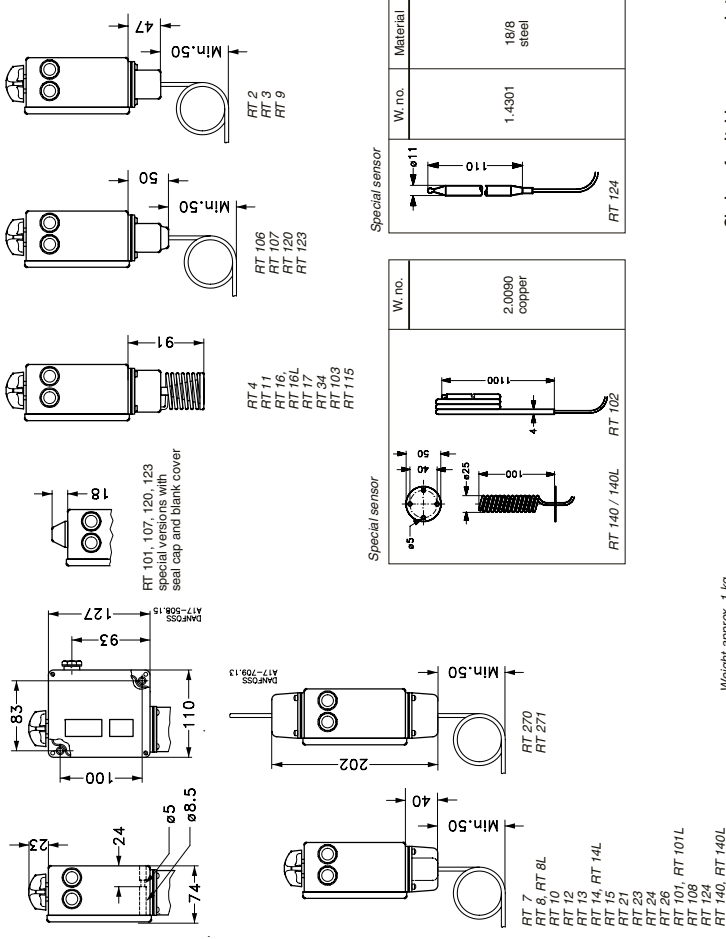
RT 2 RT23 RT 26 RT 108	RT4 RT10 RT11 RT16L RT17 RT140L	RT3 RT7 RT8 RT8L RT9	RT12 RT13 RT14 RT14L RT15	RT16 RT102 RT141 RT271 RT270	RT34 RT103 RT115 RT140	RT101 RT106 RT107 RT123	RT120	RT124	Approvals	
x	x	x	x	x	x	x	x	x		DEIMO, Denmark, CE-marked acc. to EN 60947-4/-5, EN 60730-2/-4
										Det Norske Veritas, Norway
										Lloyds Register of Shipping, UK
		x	x			x	x			④ Garmanscher Lloyd, Germany
										Bureau Veritas, France
	x	x	x	x	x	x	x	x		Registro Italiano Navale, Italy
x	x	x	x			x	x	x		⑥ Polski Rejestr Statków, Poland
x	x			x	x	x	x	x		RMPS, Russian Maritime Register of Shipping,
x	x	x	x			x	x	x		Nippon Kaiji Kyokai, Japan

Note: In addition we refer to the certificates, the copies of which can be ordered from Danfoss.
GL approval is conditional on the use of a ship's cable entry

© Danfoss A/S. 02-2004

Thermostats, type RT

Dimensions and weight



Weight approx. 1 kg

Choice of suitable sensor pocket

W.no.	Type	Capillary tube length m	L mm	Suitable sensor pocket Code no.	Material	W.no.	L mm	a ₁ mm	d mm
2.0090 copper	RT2/3/7/9/ 10/13/26/120	2, 3, 5, 8, 10	80	017-4370 017-4369	Brass 18/8 steel	2.0321 1.4301	112	G ½	11
	RT101/101L	2, 3		017-4370 017-4369	Brass 18/8 steel	2.0321 1.4301	112	G ½	11
	RT8.8L/14/14L, 15,107, 123, 270	2, 3, 5, 8, 10	110	017-4370 017-4369	Brass 18/8 steel	2.0321 1.4301	112	G ½	11
	RT101	5, 8, 10		017-4370 017-4369	Brass 18/8 steel	2.0321 1.4301	112	G ½	11
	RT14	10	150	017-4367	Brass	2.0321	182	G ½	11
2.0240 brass	RT271	10	180	017-4216	Brass	2.0321	465	G ½	11
	RT12/23	2	210	017-4216			110	G ½	15
	RT108	2	410	017-4216	Brass	2.0235	110	G ½	15
	RT106	2.3	76	060L 3330 060L 3331 060L 3329	18/8 steel	1.4301	110	G ½	15
		5	86	060L 3330 060L 3327 060L 3331 060L 3329	Brass	2.0235	110	G ½	15
				18/8 steel	1.4301	110	G ½	15	
Sensor pocket, solid version: internal diameter 13.1mm				017-4218	Al(Si) 316L	1.4435	108	G ½	15.7

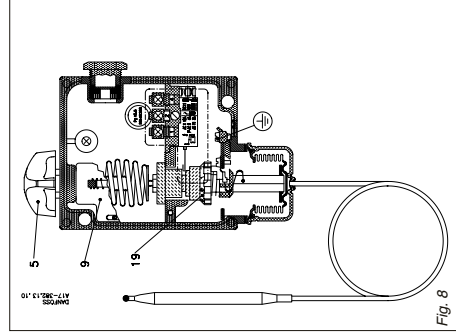
Thermostats, type RT

Installation

RT units have two fixing holes which become accessible when the front cover is removed. Units fitted with switch 017-0181*) must be installed with the setting knob upwards. The other thermostats in the RT series can be installed in any position, except that on plant subjected to severe vibrations it is advantageous to have the screwed cable entry downwards.

*) Contact system with snap-action function. See spare parts and accessories, page 28

Fig. 7. Position of unit



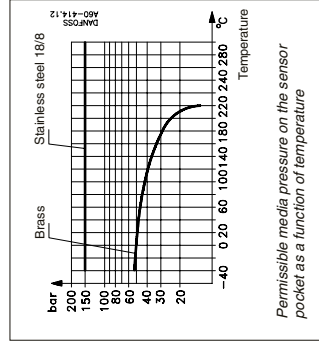
- 5. Setting knob
- 9. Main scale
- 19. Differential setting disc

Differentials
The mechanical differential is the differential that is set on the differential disc in the thermostat. The thermal differential (operating differential) is the differential the system operates on. The thermal differential is always greater than the mechanical differential and depends on three factors:
1) flow velocity of the medium
2) temperature charge rate of the medium and
3) heat transmission

The medium
The fastest reaction is obtained from a medium having high specific heat and high thermal conductivity. It is therefore advantageous to choose a medium that fulfills these conditions (provided there is a choice). The flow velocity of the medium is also of significance (Optimum flow velocity for liquids is approx. 0.3 m/s).

Example:

Regulation of a central heating boiler
The temperature in an oil-fired central heating boiler must be regulated by an RT 101. Max. temperature 76°C. Min. temperature 70°C.
Differential 76-70 = 6°C.
1. Connect the oil burner via thermostat terminals 1-2.
2. Set the thermostat on 70°C using the hand knob (5), fig. 8.
3. Set the differential disc (19) on 3. This figure is obtained from the RT 101 nomogram, page 18. When the plant has been operating for some time an assessment can be made of whether the thermal differential is satisfactory. If it is too large, reduce the mechanical differential of the thermostat.



Permissible media pressure on the sensor pocket as a function of temperature

Function

a. RT thermostats with automatic reset
The RT thermostats are set according to the function required on falling temperature. Contacts 1-4 break while contacts 1-2 make when the temperature falls to the scale setting. The contacts changeover to their initial position when the temperature again rises to the scale setting plus the differential (see fig. 9).

Contact function
I. Contact changeover for rising temperature occurs at scale setting plus differential.
II. Contact changeover for falling temperature occurs at scale setting.

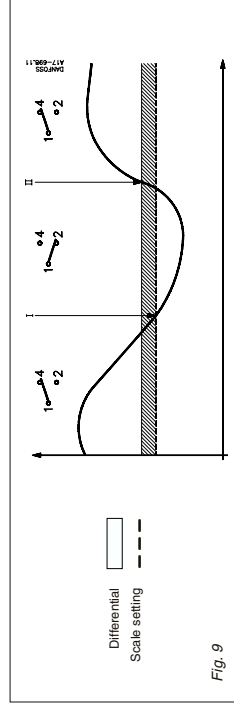


Fig. 9

b. RT thermostats with max. reset
Contacts 1-4 make while contacts 1-2 break when the temperature exceeds the set range value. The contacts changeover to their initial position when the temperature falls to the scale value minus the differential (see fig. 10).

I. Alarm for rising temperature given at the set value.
II. Alarm for falling temperature given at the set value minus the differential.
Manual reset possible only when the temperature has fallen to the range setting minus differential.

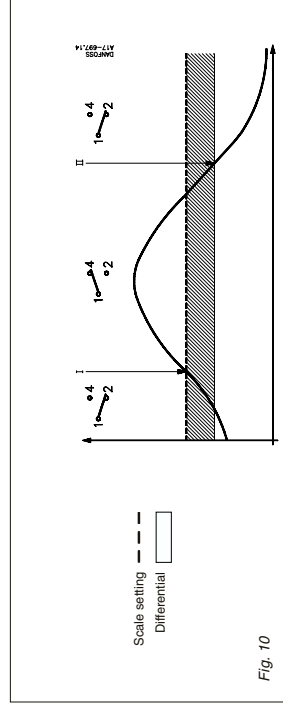


Fig. 10

RT units with vapour charge

The method of operation of these units is based on the connection between the pressure and temperature of saturated vapour. The sensor system contains just a small amount of liquid and this is brought completely to vapour form. If the sensor in this type of unit is located coldest in relation to the capillary tube and bellows housing, the ambient temperature has no influence on regulation accuracy.

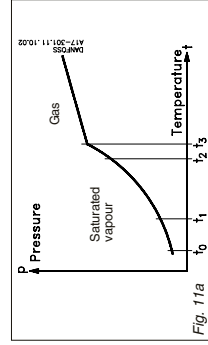


Fig. 11a

RT units with adsorption charge

The thermostatic element contains a superheated gas together with a solid substance (always in the sensor) having a large adsorption surface. This gives an advantage in that the sensor can be installed either colder or warmer than the remaining part of the thermostatic element. However, the charge is to some extent sensitive to changes in the temperature of the bellows and capillary tube.

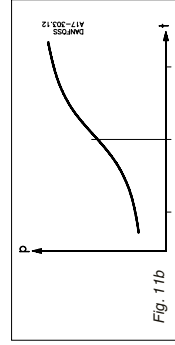


Fig. 11b

Scale correction

If the thermostat is to be used in ambient temperatures that differ significantly from the factory setting (20°C), compensation can be made for the scale deviation:

Scale correction = Z x a

Z can be found from fig. 11c, while a is the correction factor from the table.

Example:

Find the necessary scale correction for a RT 108 with a regulation range +30 to +140°C.

Setting: 85°C

Ambient temperature: 50°C

Correction:

Set value - min. scale value / max. scale value - min. scale value x 100 = %

85 - 30 / 140 - 30 x 100 = 50%

Correction factor from table 2.0 (a): +1.2 (Z)

Scale correction: Z x a = 1.2 x 2.0 = 2.4°C

Corrected setting: 85 + 2.4 = 87.4

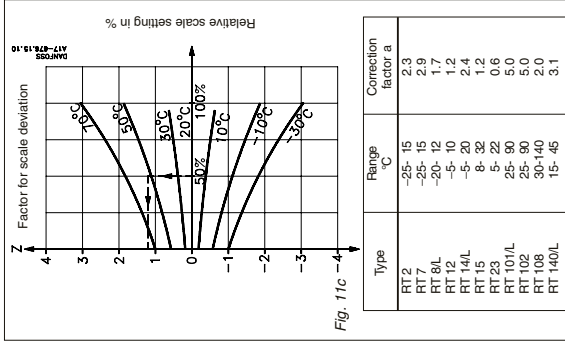


Fig. 11c

Type	Range °C	Correction factor a
RT 2	-25- 15	2.3
RT 7	-25- 15	2.9
RT 8/L	-20- 12	1.7
RT 12	-5- 10	1.2
RT 14/L	-5- 20	2.4
RT 15	5- 35	0.2
RT 22	5- 35	0.6
RT 101/L	25- 80	5.0
RT 102	25- 80	5.0
RT 108	30-140	2.0
RT 140/L	15- 45	3.1

RT units with solid charge

The method of operation of these units is based on the connection between the pressure and temperature of saturated vapour. The sensor system contains a fairly large amount of liquid, of which only a small part is brought to vapour form. If the sensor in this type of unit is located warmest in relation to the capillary tube and bellows housing, the ambient temperature has no influence on regulation accuracy.

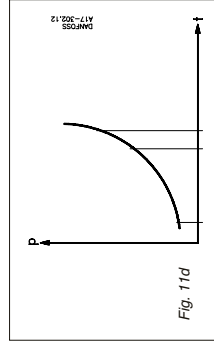
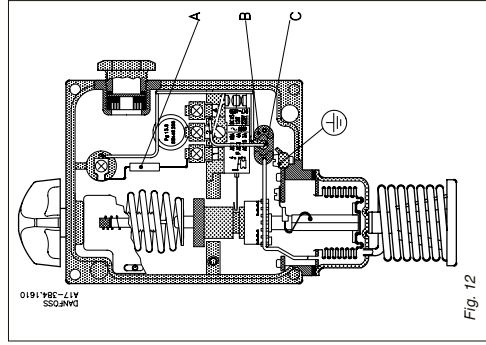


Fig. 11d

Thermostats, type RT

RT 115 for control of ventilation plant in livestock buildings



- A. Series resistor
- B. Bulb sensor
- C. Heating element

RT 115 has two sensors, each of which is connected to the space between bellows and bellows housing; see fig. 12. One sensor is a normal, external, rigid coiled capillary tube type, the other is a bulb sensor located in the thermostat housing.

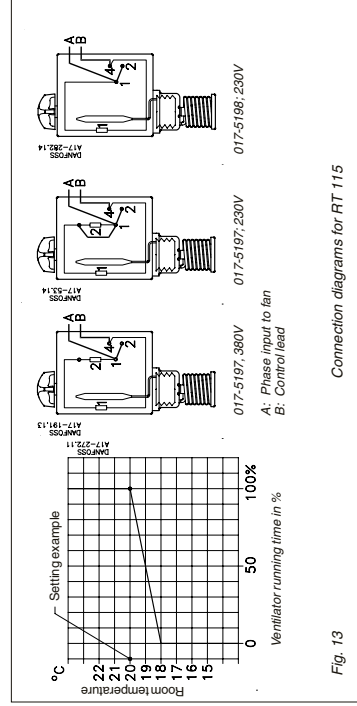


Fig. 13

Connection diagrams for RT 115

The bulb sensor is heated by an element which is cut in when the thermostat stops the fans and is cut out when the thermostat starts the fans. The fan of operation is as follows:

If the room temperature is more than the value set on the thermostat, 20°C for example, the fans run continuously (100% operating time). If the room temperature falls to 20°C, the switch contacts changeover, the fan stops and the bulb sensor heating element cuts in.

When the bulb sensor is heated up, pressure in the sensor system increases and after a certain time the switch changes over again, thereby cutting in the fans and cutting out the element.

If the room temperature falls more than 2°C under the set temperature - in this example, lower than 18°C - the fans stop completely. The heating element is cut in as usual but can no longer heat the bulb sensor sufficiently to create the required pressure increase in the thermostat element to cut in the fans again. Thus with a room temperature of less than 18°C the operating time is 0%.

An example is shown in fig. 13. With temperature settings other than the one shown, the inclined line in the diagram is displaced parallel. The line break point on the right of the diagram always corresponds to the set value. It is therefore possible to maintain a stable room temperature and at the same time obtain periodic ventilation where the duration of the ventilation periods depends on the difference between the actual room temperature and the set temperature. By ensuring that the thermostat is always set at least 2°C over the lowest permissible room temperature, the thermostat will never allow the room temperature to fall below the desired level.

Thermostats with adjustable neutral zone, type RT-L

Application

RT-L thermostats are fitted with an adjustable neutral zone. This enables the units to be used for floating control. The terminology involved is explained below.

Floating control

A form of discontinuous control where the correcting element (e.g. valve, damper, or similar) moves towards one extreme position at a rate independent of the magnitude of the error when the error exceeds a definite positive and towards the opposite extreme position when the error exceeds a definite negative value.

Hunting

Periodic variations of the controlled variable from the fixed reference.

Neutral zone

The interval in the controlled variable in which the correcting element does not respond.

Mechanical differential

The interval between the values of the controlled variable in which the correcting element does not respond.

The contact system in neutral zone units cannot be exchanged, as the contact system adjustment is adjusted to the other parts of the unit.

Neutral zone setting

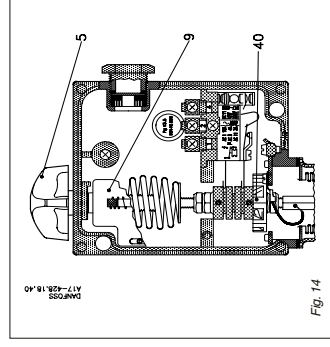


Fig. 14

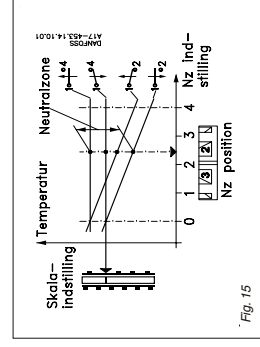


Fig. 15

Example: RT 16L

Setting temperature: +24°C

Required neutral zone: 1.9°C

Using the setting knob, set the thermostat on 24°C. The dotted lines in the diagram for the RT 16L, fig. 16, intersect each other on the curve for position 2.8 and the neutral zone setting disc (40) must be set to that position.

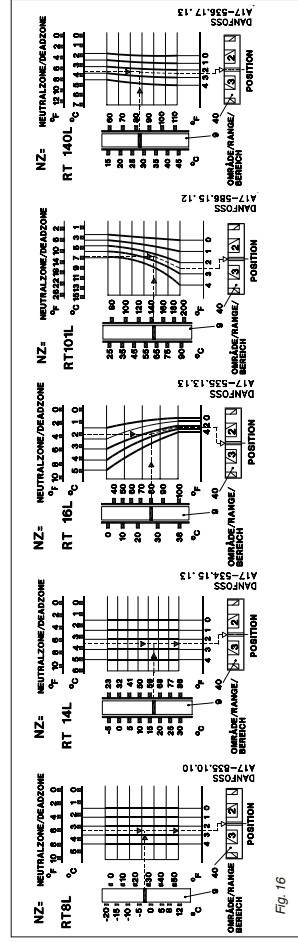


Fig. 16

Differential thermostats, type RT

Application

Control and monitoring of temperature differentials
An RT differential thermostat is an electric single-pole changeover switch. The position of the switch contacts is controlled by the difference in temperature between the two sensors of the thermostat. The RT 270 is used in process plant, ventilation

Setting

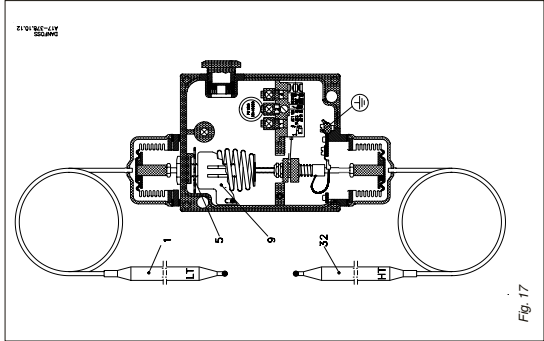


Fig. 17

- 1. Sensor for the lowest temperature (LT)
- 5. Setting disc
- 9. Scale
- 32. Sensor for the highest temperature (HT)

Function

Differential thermostats are fitted with a changeover switch (SPDT)
When the differential temperature falls below the set value, contacts 1-4 break and contacts 1-2 make. When the differential temperature rises to the set range value plus the fixed contact differential, contacts 1-2 break and contacts 1-4 make.

- I. Contacts make when differential temperature falls below the range scale setting.
- II. Contacts make when differential temperature rises above the range scale plus the fixed contact differential.

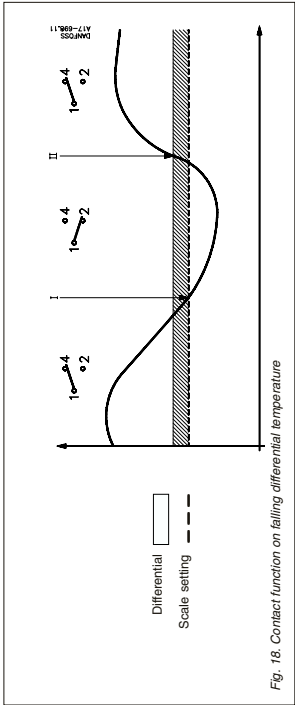


Fig. 18. Contact function on falling differential temperature

Example

The temperature rise across an air cooler must be held below 5°C. An alarm must be given when the differential temperature of the cooling water exceeds the 5°C

The choice is an RT 270 with a range of 0-15°C and a fixed contact differential of 2°C.
Range setting: 5-2°C = 3°C
When the differential temperature exceeds the range setting plus the fixed contact differential (3+2 °C) an alarm will be given.

Pressure controls and thermostats, type RT

Spare parts and accessories

Contact systems (accessories)




Version	Description	Contact rating	
Standard	Single-pole changeover switch (SPDT) with terminal board proof against leakage current. Fitted in all standard versions of type RT). Snap action changeover contacts.		017-4030
With max. reset	For manual reset of unit after contact changeover on rising pressure. For units with max. reset.	Alternating current: AC-1 (ohmic): 10 A, 400 V AC-3 (inductive): 4 A, 400 V AC-14/15 (oil/transformer): 28 A, 400 V Blocked rotor: 14 A, 400 V Direct current: DC 13/14: 12 W, 230 V	017-4042
With min. reset	For manual reset of units after contact changeover on falling pressure. For units with min. reset.		017-4041
Standard	Single-pole changeover switch (SPDT) with gold plated (oxide-free) contact surfaces. Snap action changeover contacts. Snap action changeover contacts. Terminal board proof against leakage current.	Alternating current: AC-1 (ohmic): 10 A, 400 V AC-3 (inductive): 1 A, 400 V Blocked rotor: 14 A, 400 V Direct current: DC-13/14: 12 W, 230 V	017-4240
Cuts in two circuits simultaneously	Single-pole changeover switch that cuts in two circuits simultaneously on rising pressure. Snap action changeover contacts. Terminal board proof against leakage current.	Alternating current: AC-1 (ohmic): 10 A, 400 V AC-3 (inductive): 3 A, 400 V AC-14/15 2 A, 400 V Blocked rotor: 20 A, 400 V Direct current: DC-13/14: 12 W, 230 V	017-4034
Cuts out two circuits simultaneously	Single-pole changeover switch that cuts out two circuits simultaneously on rising pressure. Snap action changeover contacts. Terminal board proof against leakage current.	* If current is led through contacts 2 and 4, i.e. terminals 2 and 4 connected but not 1, max. permissible load is increased to 90 W, 220 V ~~~.	017-4035
With non-snap action changeover contacts	Single-pole changeover with non-snap action changeover gold plated (oxide-free) contacts.	Alternating or direct current: 25 VA, 24 V	017-0181

1) At load types with low currents/voltages contact failure may occur on the silver contacts because of oxidation. In systems where such a contact failure is of great importance (alarm etc.), gold plated contacts are recommended.
Contact systems for neutral zone units are not available as spare parts.
Exchange not possible, as the contact system adjustment is adjusted to the other parts of the unit.













Pressure controls and thermostats, type RT

Spare parts and accessories

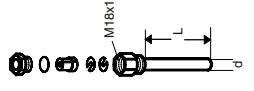
Switches

Version	Symbol	Description	Contact rating	Codeno.
With min. reset		For manual reset of unit after contact changeover on falling pressure. For units with internal reset. Gold plated (oxide-free) contact surfaces		017-4047
With max. reset		For manual reset of unit after contact changeover on rising pressure. For units with internal reset. Gold plated (oxide-free) contact surfaces	For Alarm application AC-1 (ohmic): 10 A, 400 V AC-3 (inductive): 2 A, 400 V For direct current: AC-14/15: 1 A, 400 V Blocked rotor: 14A, 400 V Direct current DC-13/14: 12W, 230 V	017-4048
With min. or max. reset		With internal reset. For units with contact changeover on falling and rising pressure. Mounted in TÜV pressure controls Gold plated (oxide-free) contact surfaces	For control application max. 100 mA / 30 V a.c. / d.c. min. 1 mA / 5 V a.c. / d.c.	017-4049

Accessories for thermostats

Part		Description	Qty.	Codeno.
Covers	 	Covers: Polyamide Pale grey RAL 7035 With window Without window	5 5	017-4361 017-4362
Setting knob		Replacement setting knob Pale grey Ral 7035	30	017-4363
Seal cap		Seal cap for replacement of setting knob so that setting can only be altered with tools Black	20	017-4360
Seal screws for cover and seal cap			1 + 1	017-4251
Capillary tube gland		For all RT thermostats with remote sensor G $\frac{1}{4}$ A (pipe thread ISO 228/1), oil resistant rubber washer for max. 110°C/90 bar.	5	017-4220
Capillary tube gland		For RT 106 thermostat with remote sensor. G $\frac{1}{4}$ A (pipe thread ISO 228/1), oil resistant rubber washer for max. 110°C/90 bar.	1	003N0155
Sensor clip		For all RT units with remote sensor L = 76 mm	10	017-4203
Clamping band		For all RT pressure controls with damping coil or other length of connection L=392 mm	1	017-4204
Heat conductive compound	  Tube Tin	For RT thermostats with the sensor insert in a pocket. Tube with 3,5 cm ³ compound to be filled in the sensor pocket to improve heat transfer between pocket and sensor. The tin contains 750 gr. Application range for compound: -20 til + 150°C, momentarily up to 220°C.	1	Tube 041ED110 Tin 041ED111
Sensor holder		For RT 14, 101 and 270 Sensor holder for wall mounting incl. four capillary tube clips	20 set	017-4201

Sensor pocket for RT thermostats with cylindrical remote sensor

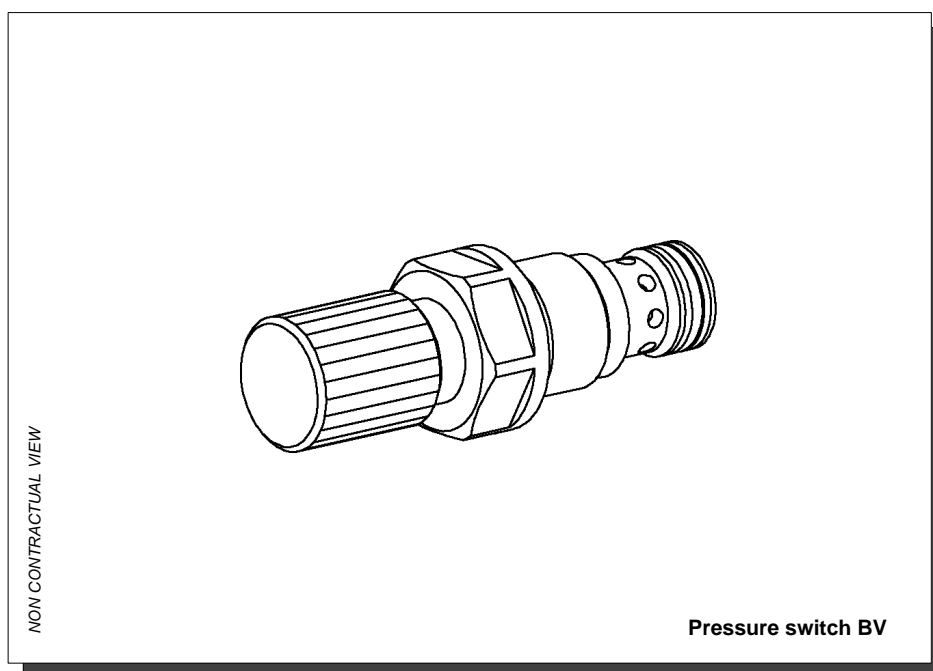
Used for the following types		Insertion length L mm	d mm	Material	Connection pipe thread ISO 228/1	Codeno.
All except RT 12, 23, 106, 108, 124, 270		112	11	Brass	G $\frac{1}{8}$ A	017-4370
All except RT 12, 23, 106, 108, 124, 271		112	11	Stainless 18/8	G $\frac{1}{8}$ A	017-4369
RT 106, RT 124 ^{a)}		110	15	Brass	G $\frac{1}{8}$ A	060L3271 ¹⁾
RT 106, RT 124 ^{a)}		110	15	Stainless 18/8	G $\frac{1}{8}$ A	060L3268 ¹⁾
RT 106, RT 124 ^{a)}		160	15	Brass	G $\frac{1}{8}$ A	060L3263 ¹⁾
RT 106, RT 124 ^{a)}		160	15	Stainless 18/8	G $\frac{1}{8}$ A	060L3269 ¹⁾
RT 271		182	11	Brass	G $\frac{1}{8}$ A	017-4367
RT 108		465	11	Brass	G $\frac{1}{8}$ A	017-4216

¹⁾ Supplied without washer set^{a)} Unit supplied with washer set

See possibly page 21

5.14 PRESSURE SWITCH TYPE BVS (WANDFLUH)

Location	ECL code	Reference
Hydraulic Unit	1-10-733-20	BVS PM 22-350-D1



Pressure relief valve

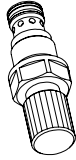
Screw-in cartridge

- Pilot operated
- $Q_{max} = 100 \text{ l/min}$
- $p_{max} = 400 \text{ bar}$
- $p_N = 350 \text{ bar}$

DESCRIPTION

Pilot operated pressure relief valve as screw-in cartridge with a thread M22x1.5 and cavity according to ISO draft 7789. The valve is available in three different setting versions: Key setting "S" and turning knob setting "D". Both with arrest device, as well as in a lockable version "K". Key adjustment "S" is also available with cover, see data sheet 2.0-50. Three standard pressure levels are available: 63, 160 and 350 bar. The cartridge body made of steel is galvanized and therefore rust-protected. The aluminium turning knob, color-less anodized, gives this quality product a clean design.

M22x1,5
ISO 7789



FUNCTION

When the set operating pressure is reached, the main spool opens and connects the protected line with the return line to the tank. These pressure relief valves consist of a main- and a pilot operation system integrated into the cartridge. The pilot operation is a direct operated pressure relief valve which acts on the main system. The helical spring of the pilot operation can be easily set to the desired operating pressure. Pilot operated pressure relief valves can be very sensitively adjusted and are suitable for large oil flows and high pressure. The very limited play of the hardened spool results in a limited oil leakage.

APPLICATION

For limiting the operating pressure in hydraulic systems by releasing the oil from the protected oil line P (1) to the outlet/tank return line T (2). The screw-in cartridge is very suitable for mounting in control blocks and is built into the Wandfluh hydraulics NC4, NG6 and NG10 as a functional element in sandwich style plates (vertical combination) and flange-mounted valves (please refer to the separate data sheets in register 2.1). Stepped tools are available for making the receptacle bores in steel and aluminium (Hire or purchase). Please refer to the data sheets in register 2.13.

Attention: Should therefore not be utilized any more in applications with periodically changing direction of flow.

CONTENT

GENERAL SPECIFICATIONS.....	1
HYDRAULIC SPECIFICATIONS.....	1
SYMBOL.....	1
MECHANICAL ACTUATION.....	1
CHARACTERISTICS.....	2
DIMENSIONS.....	2
PARTS LIST.....	2
ACCESSORIES.....	2

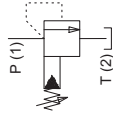
GENERAL CHARACTERISTICS

Description	Pilot operated pressure relief valve
Construction	Screw-cartridge for cavity acc. to ISO 7789
Mounting	Screw thread M22x1.5
Ambient temperature	any
Mounting position	-20...+50 °C
Fastening	$M_b = 50 \text{ Nm}$
Weight	$m = 0,15 \text{ kg (key)}$ $m = 0,16 \text{ kg (control knob)}$ $m = 0,26 \text{ kg (lock)}$

HYDRAULIC CHARACTERISTICS

Hydraulic fluid	Mineral oils, other fluids on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade 8,6...10<75) refer to data sheet 1.0-50/2
Viscosity range	12 mm ² /s...320 mm ² /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 400 \text{ bar}$
Nominal pressure range	$p_N = p_s + 20 \text{ bar}$
Minimum pressure	$p_N = 63 \text{ bar}, p_N = 160 \text{ bar}, p_N = 350 \text{ bar}$
Volume flow	see characteristics
Leakage volume flow	$Q = 0,2...100 \text{ l/min}$

SYMBOL



MECHANICAL ACTUATION

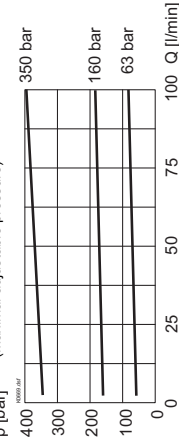
Mechanical types of operation in 3 different versions:	
S	= Key adjustment by means of Allen key and screw driver
D	= Control knob adjustment, fixed
K	= Lock adjustment
Actuation stroke S_s	= 5 mm
Actuation angle α_s	= 1800° (5 revolutions)

TYPE CODE	B	V	PM22	-	#
Pressure relief valve					
Pilot operated					
Types of adjustment:					
Key	S				
Control knob	D				
Lock	K				
Cover	A				
Screw-in cartridge M22x1.5					
Pressure range:					
					63
					160
					350
Design-Index (Subject to change)					

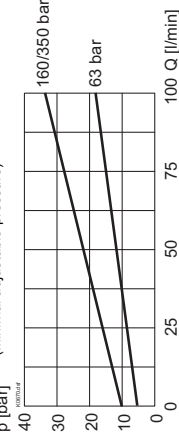
CHARACTERISTICS

Oil viscosity $\nu = 30 \text{ mm}^2/\text{s}$

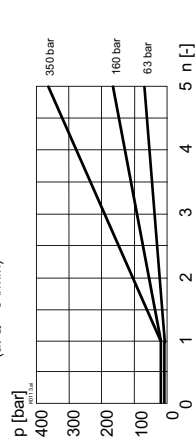
$p = f(Q)$ Pressure volume flow characteristics (Maximal adjustable pressure)



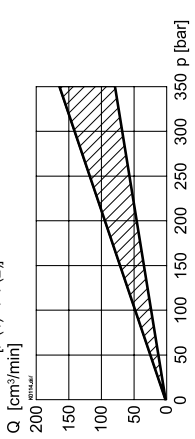
$p = f(Q)$ Pressure volume flow characteristics (Minimal adjustable pressure)



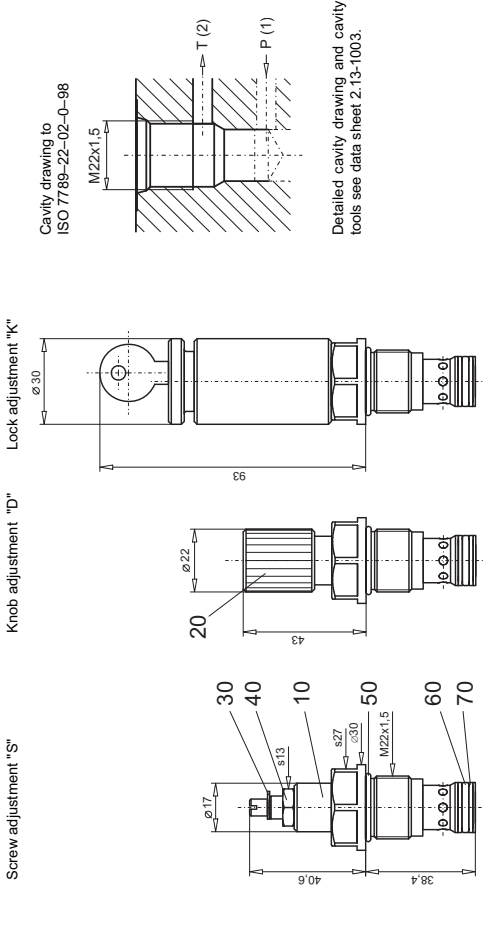
$p = f(n)$ Pressure adjustment characteristics (at $Q = 5 \text{ l/min}$)



$Q_L = f(p)$ Leakage volume flow characteristics ($P(1) \rightarrow T(2)$)



DIMENSIONS



PARTS LIST

Position	Article	Description
10	592.4300	BV/PM22- 63 pre-mounted
	592.4301	BV/PM22-160 pre-mounted
	592.4302	BV/PM22-350 pre-mounted
20	114.2217	Knob
30	193.1050	Safety plate RD5 DIN 6799
40	153.1402	Hexagonal nut 0,5D M8x1
50	160.2188	O-ring ID 18,77x1,78
60	160.2140	O-ring ID 14,00x1,78
70	049.3177	Back-up ring RD 14,6x17,5x1,4

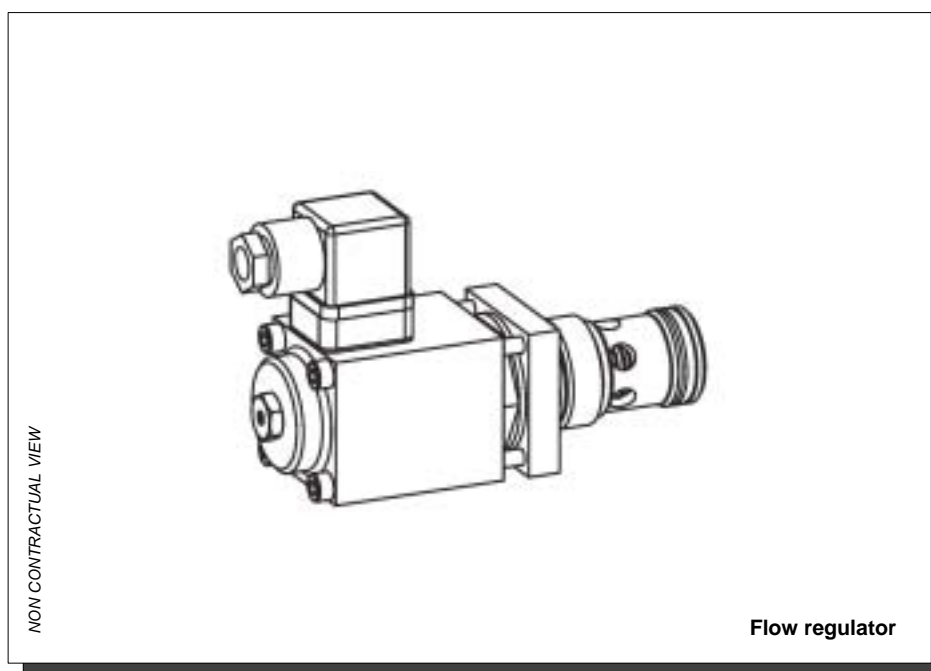
ACCESSORIES

Cartridge built into flange- or sandwichbody:
Flange valve register 2.1
Sandwich valve register 2.1

Technical explanation see data sheet 1.0-100E

5.15 FLOW REGULATOR TYPE QNPP (WANDFLUH)

Location	ECL code	Reference
Hydraulic Unit	1-10-255-86	QNPP M33-63-G24-D1

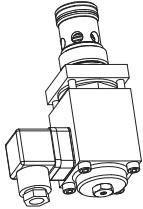


Proportional 2-way flow control valve

Screw-in cartridge

- Direct operated, pressure compensated
- $Q_{\max} = 63 \text{ l/min}$, $p_{\max} = 350 \text{ bar}$
- $Q_N = 63 \text{ l/min}$

M33x2
ISO 7789



DESCRIPTION

Direct operated, pressure compensated proportional flow control valve, as a screw-in cartridge with a thread M33x2 for cavity acc. to ISO 7789. Two flow ranges are available. The volume flow is adjusted by a Wandfluh proportional solenoid (VDE standard 0580). Almost linear flow increase and low hysteresis are typical for this valve. The cartridge body made of steel is special surface coated for corrosion rust protection and low friction of control- and throttle spools. The solenoid is zinc coated.

FUNCTION

The 2-way flow control valve is designed to keep the oil flow to any actuator constant irrespective of the load. The force controlled proportional solenoid running in the fluid acts directly on the restrictor spool which opens the throttling notches in the cartridge body. The changes proportionally to the current absorption of the proportional solenoid. If pressure in the system changes the pressure compensator will change the area of the oil passage to an extend as to keep the pressure drop over the restrictor constant. When the solenoid is without current, the restrictor spool is held in the closed position by a spring. To control the valve Wandfluh proportional amplifiers are available (see register 1.13).

APPLICATION

Proportional flow control valves are suitable for precise feed control system where the supply volume flow needs to be kept constant even when the load fluctuates. The screw-in cartridge is very suitable for mounting in control blocks, flange bodies and sandwich plates size NG10. Stepped tools are available for making the receptacle bores in steel and aluminum (hire or purchase). Please refer to the data sheets in register 2.13.

CONTENTS

GENERAL SPECIFICATIONS	1
HYDRAULIC SPECIFICATIONS	1
ELECTRIC SPECIFICATIONS	1
SYMBOLS	1
CHARACTERISTICS	2
DIMENSIONS/ SECTIONAL DRAWINGS	2
PARTS LIST	2
ACCESSORIES	2

TYPE CODE

Q	N	P	PM33	-	-	-	#
Flow control valve							
Normally closed							
Proportional							
Screw-in cartridge M33x2							
Nominal volume flow rates Q_N				32	63		
				l/min	l/min		
Standard nominal voltage U_N				12 VDC	24 VDC		
				G12	G24		
Design-Index (Subject to change)							

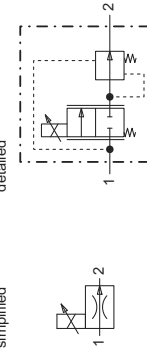
GENERAL SPECIFICATIONS

Description	2-way proportional flow control valve
Construction	Screw-in cartridge for cavity acc. to ISO 7789
Operations	Proportional solenoid
Mounting	Screw-in thread M33x2
Ambient temperature	-20...50 °C
Mounting position	any
Fastening torque	$M_C = 80 \text{ Nm}$ for screw-in cartridge $M_C = 5,2 \text{ Nm}$ (Qual. 8.8) for solenoid screws
Weight	$m = 1,2 \text{ kg}$
Flow direction	1 → 2

ELECTRICAL SPECIFICATIONS

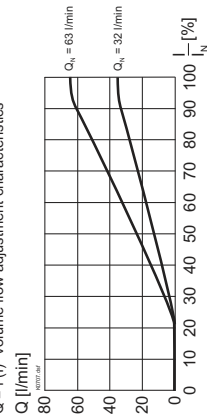
Construction	Proportional solenoid, wet pin push type, pressure tight
Standard nominal voltage	$U = 12 \text{ VDC}$
Limiting current	$I_0 = 1780 \text{ mA}$
Relative duty factor	$I_0 = 24 \text{ VDC}$ $I_0 = 810 \text{ mA}$
Protection class	100% ED (see data sheet 1.1-430)
Connection/ Power supply	IP 65 acc. to EN 60 529 Over device plug connection to ISO 4400 / DIN 43650 (2P+E)
Other electrical specifications	see data sheet 1.1-130 (P145)

SYMBOLS

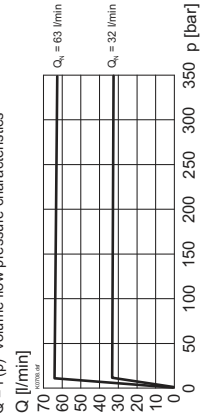


CHARACTERISTICS Oil viscosity $\nu = 30 \text{ mm}^2/\text{s}$

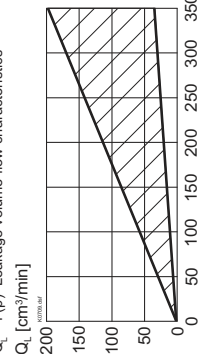
$Q = f(i)$ Volume flow adjustment characteristics



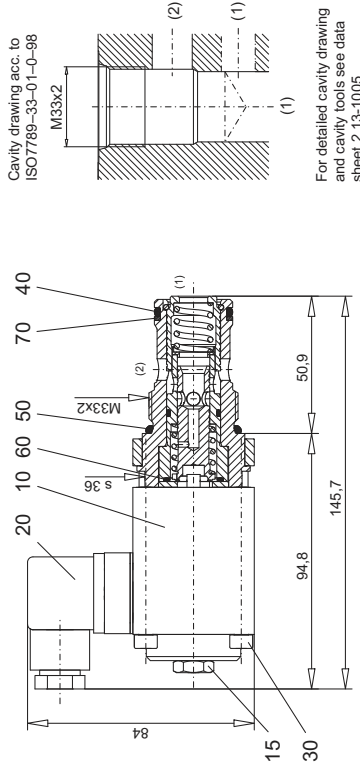
$Q = f(p)$ Volume flow pressure characteristics



$Q_L = f(p)$ Leakage volume flow characteristics



DIMENSIONS / SECTIONAL DRAWINGS



PARTS LIST

Position	Article	Description
10	256.4454	Proportional solenoid P145V-G24
	256.4418	Proportional solenoid P145V-G12
15	253.8001	Plug with integrated manual override HB6
20	219.2002	Plug (black)
30	246.2171	Cyl. screw M5x70 DIN 912
40	160.2238	O-ring ID 23.81x2.62
50	160.2298	O-ring ID 29.82x2.62
60	160.2188	O-ring ID 18.77x1.78
70	049.3297	Back-up ring RD 24.5x29x1.4

ACCESSORIES

Proportional amplifier

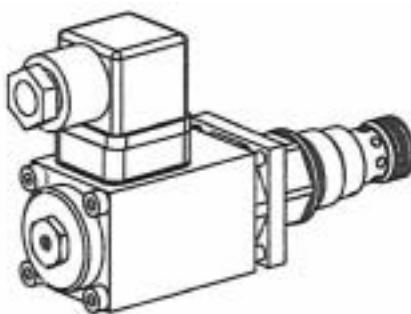
Register 1.13

Technical explanation see data sheet 1.0-100

5.16 PROPORTIONAL P LIMITER TYPE BVP (WANDFLUH)

Location	ECL code	Reference
Hydraulic Unit	1-10-255-92	BVP PM22-350-G24

NON CONTRACTUAL VIEW

**Proportional limiter BVP**

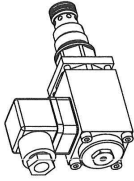
Proportional pressure relief valve

Screw-in cartridge

- Pilot operated
- $Q_{max} = 100 \text{ l/min}$
- $p_{max} = 400 \text{ bar}$
- $p_{Nmax} = 350 \text{ bar}$

DESCRIPTION

Pilot operated proportional pressure relief valve as a screw-in cartridge with a thread M22x1.5 for cavity according to ISO 7789. 4 standard pressure levels are available: 20, 100, 200 and 350 bar. Adjustment by a Wandfluh proportional solenoid (VDE standard 0580). The cartridge and the solenoid made of steel are zinc coated and therefore rust-protected.



M22x1,5
ISO 7789

APPLICATION

The valve has its application in hydraulic systems, in which the pressure frequently has to be changed. The facility for remote control and signal processing from process control systems enable elegant, comfortable solutions to problems. Installation of the screw-in cartridge in control blocks as well as in the Wandfluh sandwich plates (vertical stacked systems) and flange valves of the NG4-Mini, NG6 and NG10 types. (Please note the separate data sheets in register 2.3). Cavity tools are available for machining the cavities in steel and aluminium (hire or purchase). Please refer to the data sheets in register 2.13.

FUNCTION

When the operating pressure set by the proportional solenoid is reached, the main spool opens and connects the protected line with the return line to the tank. The back pressure in T (2) influences the pressure in P (1). This pilot operated proportional pressure relief valve can be adjusted very sensitively and is suitable for large volume flows and high pressures. To control the valve Wandfluh proportional amplifiers are available (see register 1.13).

CONTENT

GENERAL SPECIFICATIONS	1
HYDRAULIC SPECIFICATIONS	1
ELECTRICAL SPECIFICATIONS	1
SYMBOL	1
CHARACTERISTICS	2
DIMENSIONS/SECTIONAL DRAWINGS	2
PARTS LIST	2
ACCESSORIES	2

TYPE CODE	B	V	P	PM22	-	#				
Pressure relief valve										
Pilot operated										
Proportional										
Screw-in cartridge M22x1.5										
Standard nominal pressure range:	<table><tr><td>20</td></tr><tr><td>100</td></tr><tr><td>200</td></tr><tr><td>350</td></tr></table>						20	100	200	350
20										
100										
200										
350										
	<table><tr><td>$p_N = 20 \text{ bar}$</td></tr><tr><td>$p_N = 100 \text{ bar}$</td></tr><tr><td>$p_N = 200 \text{ bar}$</td></tr><tr><td>$p_N = 350 \text{ bar}$</td></tr></table>						$p_N = 20 \text{ bar}$	$p_N = 100 \text{ bar}$	$p_N = 200 \text{ bar}$	$p_N = 350 \text{ bar}$
$p_N = 20 \text{ bar}$										
$p_N = 100 \text{ bar}$										
$p_N = 200 \text{ bar}$										
$p_N = 350 \text{ bar}$										
Standard nominal voltage:	<table><tr><td>G12</td></tr><tr><td>G24</td></tr></table>						G12	G24		
G12										
G24										
	<table><tr><td>$U_N = 12 \text{ VDC}$</td></tr><tr><td>$U_N = 24 \text{ VDC}$</td></tr></table>						$U_N = 12 \text{ VDC}$	$U_N = 24 \text{ VDC}$		
$U_N = 12 \text{ VDC}$										
$U_N = 24 \text{ VDC}$										
Design-Index (Subject to change)										

Design-Index (Subject to change)

* Data sheet is valid from design-index # 2 on

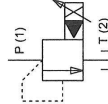
GENERAL SPECIFICATIONS

Description	Pilot operated proportional pressure relief valve
Construction	Screw-in cartridge for cavity to ISO 7789
Operations	Proportional solenoid
Mounting	Screw-in thread M22x1.5
Ambient temperature	-20...+50°C
Mounting position	any
Fastening torque	$M_N = 50 \text{ Nm}$ for screw-in cartridge $M_N = 2.6 \text{ Nm}$ (qual. 8.8) for solenoid screws
Weight	$m = 0.6 \text{ kg}$

HYDRAULIC SPECIFICATIONS

Fluid	Mineral oil, other fluid on request
Contamination	ISO 4406:1999, class 18/16/13
efficiency	(Required filtration grade $\beta_{0.5/2} \geq 10 \times 75$) see data sheet 1.0-50/2
Viscosity range	12 mm ² /s...320 mm ² /s
Fluid temperature	-20...+70°C
Peak pressure	$p_{max} = 400 \text{ bar}$
Nominal pressure ranges	$p_{Nmax} = 20 \text{ bar}$, $p_N = 100 \text{ bar}$, $p_N = 200 \text{ bar}$, $p_N = 350 \text{ bar}$
Volume flow	$Q_N = 0.3...100 \text{ l/min}$
Leakage volume flow	see Characteristics
Repeatability	$\leq 3\%$
Hysteresis	$\leq 4\%$
	* at optimal (dither signal)

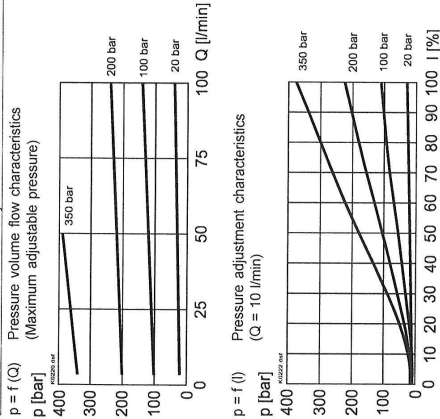
SYMBOL



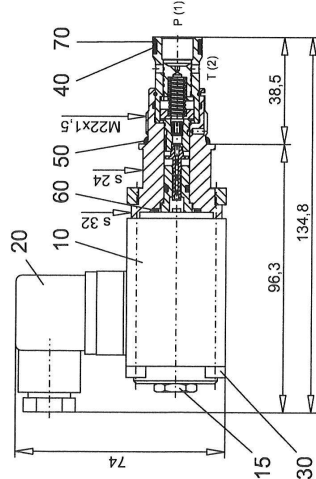
Proportional solenoid, wet pin push type, pressure light.

Standard-Nominal voltage	$U_N = 12 \text{ VDC}$	$U_N = 24 \text{ VDC}$
Limiting current	$I_N = 1250 \text{ mA}$	$I_N = 680 \text{ mA}$
Relative duty factor	100% DF (see data sheet 1.1-430)	
Protection class	IP 65 acc. to EN 60 529	
Connection/Power supply	Over device plug connection to ISO 4400 / DIN 43 650 (2P+E)	
Other electrical specifications	see data sheet 1.1-115 (PI35V)	

CHARACTERISTICS oil viscosity $\nu = 30 \text{ mm}^2/\text{s}$



DIMENSIONS / SECTIONAL DRAWINGS



Cavity drawing according to ISO 7789-22-02-0-98

For detailed cavity drawing and cavity tools see data sheet 2.13-1003

PARTS LIST

Position	Article	Description
10	256.3505	Proportional solenoid PI35MV-G24
	256.3443	Proportional solenoid PI35MV-G12
15	253.8000	Mounted screw with integrated manual override HB4.5
20	219.2002	Plug (black)
30	249.1007	Socket head cap screw M4x63
40	160.2140	O-ring ID 14.00x1.78
50	160.2188	O-ring ID 18.77x1.78
60	160.2140	O-ring ID 14.00x1.78
70	049.3177	Back up ring RD 14.6x17.5x1.4

ACCESSORIES

- Cartridge built-in flange- or sandwich body
- Flange body / sandwich plate
- Proportional amplifier

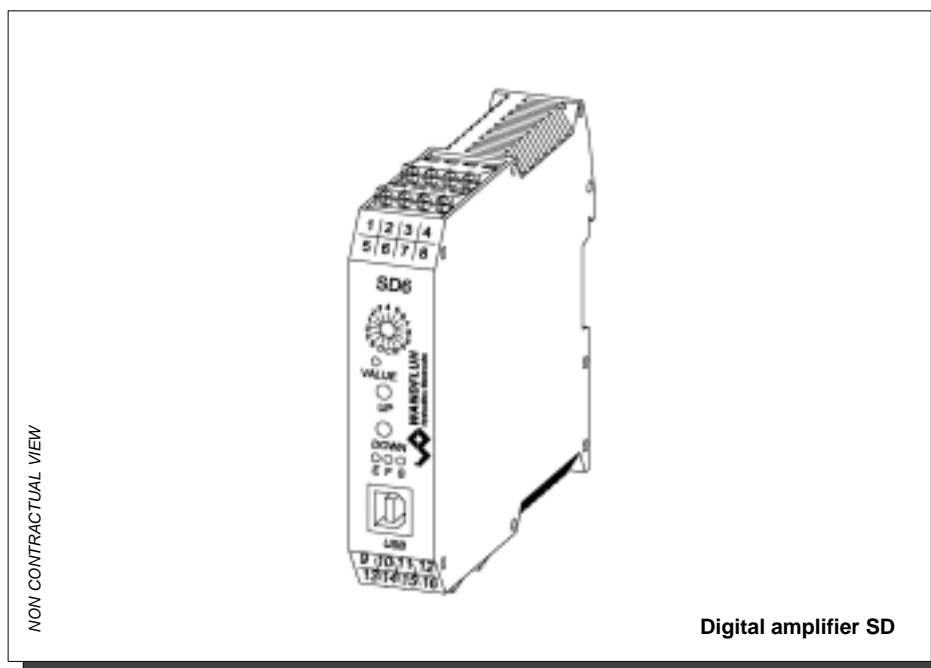
Register 2.3
Register 1.13

Technical explanation see data sheet 1.0-100E

Non trouvé

5.17 DIGITAL AMPLIFIER MODULE SD6 (WANDFLUH)

Location	ECL code	Reference
Hydraulic Unit	1-10-373-90	SD6312D21-AA



Digital amplifier module SD6

- for 1 or 2 proportional solenoids
- Interface: - analogue
- Profibus DP
- 2 analogue differential inputs
- max. 8 digital inputs
- 7 fixed command values
- Electronic card setting via PC
(optionally with manual operation on front panel)
- for snapping on to dome-rails



DESCRIPTION

Digital amplifier module for installation on dome-rails for driving proportional valves with one or two solenoids. The parameterisation takes place by means of menu-controlled parameterisation- and diagnostics software «PASO» from Wandfluh (USB-interface) or optionally with a manual control on the front panel. Separate ramps for up and down are integrated in the amplifier module as standard equipment. The electronics are equipped with optionally fixed settable command values or with Profibus-DP - interface.

FUNCTION

The amplifier module has one, resp., two **P**ulse-**M**odulated current outputs with superimposed digital signal, whereby the different frequency and the different level can be adjusted separately. The preset value can be input as a voltage signal in the range of 0...10V, resp. $\pm 10V$ (only 2-solenoid version), as a current signal 0...20mA resp. 4...20mA or applied through the field bus interface (Profibus DP). Up to 7 command values can be set and called-up (fixed command values). The amplifier module furthermore has one digital input each for the enabling and for the changeover from solenoid B, as well as one digital output each as «error identification» or «solenoid Active» (reversible) and «solenoid B active».

APPLICATION

As snap-on module the electronic card is mainly utilised in the industrial field. The module can be mounted on dome-rails. The connection with terminal screws enables commissioning without special tools in a short time. The amplifier module is particularly suitable for applications with additional functions such as ramps, preset values, etc. Customer-specific requirements can be implemented in a simple manner.

CONTENT

- GENERAL SPECIFICATIONS.....1
- AMPLIFIER WITH ANALOGUE INTERFACE3
- AMPLIFIER WITH PROFIBUS INTERFACE.....8
- AMPLIFIER WITH ANALOGUE INTERFACE AND FIXED COMMAND VALUES14

TYPE CODE

Module for electrical control cubicle

Digital

Parameters to be set with:

- PASO and manual operation

2	3
---	---
- PASO without manual operation

	3
--	---

Software configuration (function of card):

- Standard amplifier

0

- Amplifier with operation mode 4

1

 (only in case of PASO without manual operation)
- Amplifier with fixed command value

2

- 1-solenoid version

1

- 2-solenoid version

2

Supply voltage:

- 24 VDC

D2

- 12 VDC

D3

Standard amplifier:

- Preset value selectable voltage or current

0

- Amplifier with operation mode 4:
- Preset value: fixed, both voltage

1

- Preset value: fixed, both current

2

Hardware configuration:

- 10-Bit resolution

Option field bus:

- without field bus (with analogue input signal)

A

- with Profibus DP

B

(Not in the case of SD6 with fixed command values)
(Only in case of PASO without manual operation)

Design-Index (Subject to change)

GENERAL SPECIFICATIONS

Module for electrical control cubicle, housing made of plastic

Execution

Dimensions

- Amplifier module analogue 105x114x22,5 mm (see dimensions)
- Amplifier module Profibus 105x114x45 mm (see dimensions)
- Amplifier module analogue with fixed command values 105x114x45 mm (see dimensions)

Installations

for 35 mm dome rail acc. to EN 60715

Weight

130 g

220 g

Screw terminals, max. cable cross-sections 2,5 mm²

Connections

Working temperature

-20 ...+70 °C

In operation mode 4, the total solenoid current of simultaneously

powered solenoids depends on the ambient temperature.

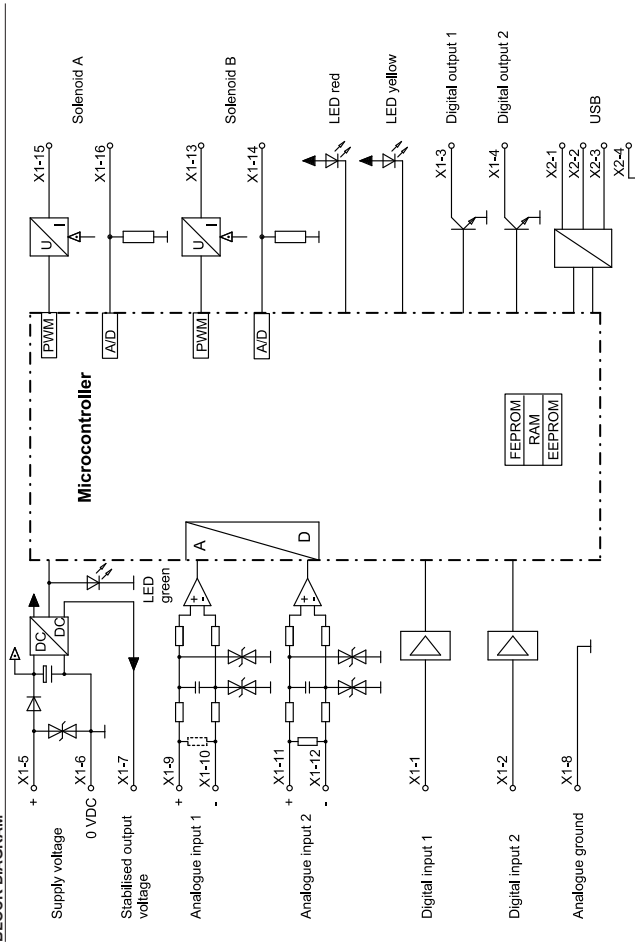
Further information can be found in the operating instructions.

Amplifier with analogue interface

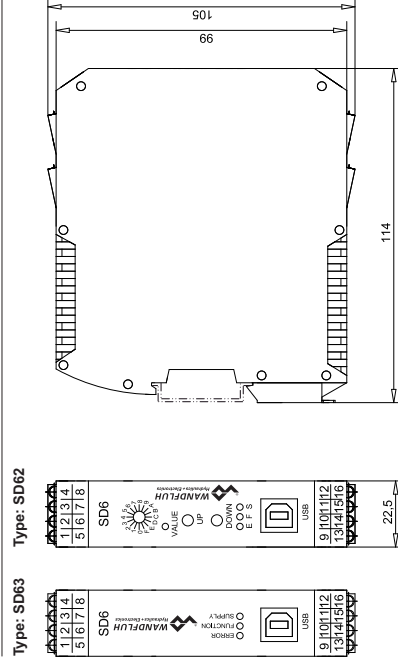
ELECTRICAL SPECIFICATIONS

Protection class	IP30 acc. to EN 60 529	Solenoid current:	Adjustable 0...950 mA
Supply voltage	24 VDC or 12 VDC	• Minimal current I_{min}	Factory-preset 150 mA
Voltage range:		• Maximal current I_{max}	Adjustable I_{max} ...1.8 A (with 24 VDC) I_{max} ...2.3 A (with 12 VDC)
• 24 VDC	21...30 V		Factory-preset 700 mA
• 12 VDC	10.5...15 V		
Ripple on supply vol.	<10 %		
Fuse	slow	• Accumulated current limitation	
Current consumption:			
• No-load current	ca. 40 mA		
• Maximum current consumption	no-load current +1.8 A per solenoid (with 24 VDC) no-load current +2.3 A per solenoid (with 12 VDC)		
Command value signal:	Selectable with software		
	Diff. inputs not galvanically separated, for earth potential differences up to 1.5 V	• In operation mode 4, the total solenoid current of simultaneously powered solenoids depends on the ambient temperature. Further information can be found in the operating instructions.	
	4...+20 mA/0...+20 mA	Frequency adjustable 20...500 Hz	
	0...+10 V (1- or 2-solenoid version)	Factory-preset 100 Hz	
	-10...+10 V (only 2-solenoid version)	Amplitude adjustable 0...400 mA	
Input resistance	Voltage input >18 kΩ	Factory-preset 100 mA	
Load for current input = 250 Ω	Load for current input = 250 Ω	<1 % at $\Delta T = 40^\circ C$	
Stabilised output voltage	10 VDC (with version 24 VDC) 8 VDC (with version 12 VDC) max. load 30 mA	Switching threshold high 6...30 VDC Switching threshold low 0...1 VDC Signal active at 6...30 VDC (active high) On request: Signal active at 0...1 VDC (active low) Low-Side-Switch	

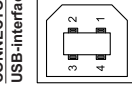
BLOCK DIAGRAM



DIMENSIONS



CONNECTOR WIRING DIAGRAM/PIN ASSIGNMENT



1 = VBUS
2 = D-
3 = D+
4 = GND

PIN-assignment X1

- 1 = Digital input 1
- 2 = Digital input 2
- 3 = Digital output 1
- 4 = Digital output 2
- 5 = Supply Analogue Input +
- 6 = Supply voltage 0 VDC
- 7 = Stabilised output voltage
- 8 = Analogue ground
- 9 = Analogue input 1 +
- 10 = Analogue input 1 -
- 11 = Analogue input 2 +
- 12 = Analogue input 2 -
- 13 = Output solenoid B +
- 14 = Output solenoid B -
- 15 = Output solenoid A +
- 16 = Output solenoid A -

REMARK!

The parameterisation cable is not part of the scope of supply (commercially available USB-cable, plug type A to plug type B)



Configuration Analogue input

Type description	Analogue input 1	Analogue input 2
SD6.0.D.0-AA	Voltage	Current
SD6312D.1-AA	Voltage	Voltage
SD6312D.2-AA	Current	Current

START-IP

START-UP
Information regarding installation and commissioning are contained in the information leaflet supplied with the amplifier module and in the operating instructions.

Additional information can be found on our website:
«www.wandfluh.com»

Free-of-charge download:

- «PASO-DSV/SD6» Parameterisation software
- Operating instructions (*pdf)

ADDITIONAL INFORMATION

ADDITIONAL INFORMATION	
Wandfluh electronics general	Wandfluh documentation
Accessories	register 1.13
Proportional directional valves	register 1.10
Proportional pressure valves	register 2.3
Proportional flow control valves	register 2.6

DESCRIPTION of «SD6»-electronics with analog interface

Design

The amplifier module can be parameterised by means of the parameterisation software «PASO-DSV/SD6» through the USB-interface. In addition, the parameterisation software makes a data analysis possible. The software «PASO-DSV/SD6» is supported by Windows 2000 and Windows XP.

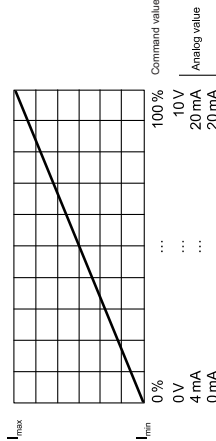
Description of Function

Hardware-Configuration with Analogue Signal

The amplifier module SD6 serves for driving proportional valves and has one (in the case of the 1-solenoid version) or two (in the case of the 2-solenoid version) Pulse-Width-Modulated current outputs with superimposed diifer signal, whereby the diifer frequency and the diifer level can be set separately. In the case of the 1-solenoid version, the preset value can be input in a range of 0...10 V (voltage input) or 0...20 mA resp. 4...20 mA (current input). In case of the 2-solenoid version, the preset value can be input in the range of 0...10 V, resp. 0...10 V (voltage input) or 0...20 mA, resp. 4...20 mA (current input). The amplifier module furthermore has two digital inputs for the enabling and the changeover from solenoid A to solenoid B, as well as two digital outputs for «Error detection» or «Solenoid A active» (reversible) and «Solenoid B active». The parameterisation takes place through the parameterisation software «PASO-DSV/SD6» and optionally through a manual parameterisation interface. Changed parameters are stored in a non-volatile memory, so that they are available again after a renewed switching-on of the control system.

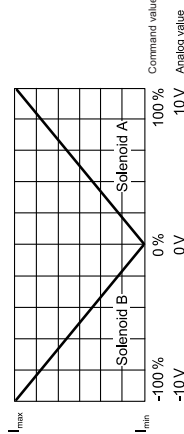
Operating mode 1: Command value unipolar (1-sol.)

This operating mode is only selectable in case of the 1-solenoid version. In dependence of a unipolar analogue input (voltage or current), the solenoid is driven. (0...10 V, 0...20 mA, 4...20 mA respectively correspond to 0...100% preset value signal) / (0...100% preset value signal correspond to I_{min} ... I_{max} solenoid).



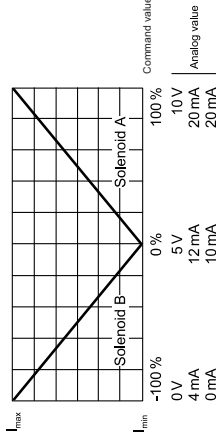
Operating mode 3: Command value bipolar (2-sol.)

This operating mode is only selectable in case of the 2-solenoid version. In dependence of a bipolar analogue input (voltage), depending on the signal level solenoid A or solenoid B is driven. The changeover threshold between the two solenoids as standard setting is at 0 V. (-10...+10 V correspond to -100...+100% preset value signal) / (-100...0% command value signal correspond to I_{min} ... I_{max} solenoid B and 0...100% command value signal correspond to I_{min} ... I_{max} solenoid A).



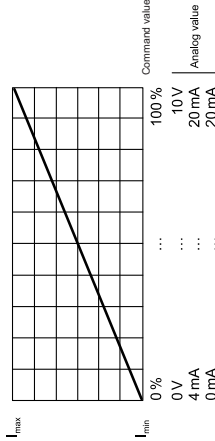
Operating mode 2: Command value unipolar (2-sol.)

This operating mode is only selectable in case of the 2-solenoid version. In dependence of a unipolar analogue input (voltage or current), depending on the signal level solenoid A or solenoid B is driven. The changeover threshold between the two solenoids as standard setting is in the middle of the values range of the analogue signal. (0...10 V, 0...20 mA, 4...20 mA respectively correspond to -100%...+100% of the command value signal) / (-100...0% preset value signal correspond to I_{min} ... I_{max} solenoid B and 0...100% preset value signal correspond to I_{min} ... I_{max} solenoid A).



Operating mode 4: Command value unipolar (2-sol. single (2-solenoid version))

In this operating mode every solenoid output can be driven by a preset value of its own (refer to connection example «Operating mode 4»). This operating mode is only selectable in case of the 2-solenoid version with the option «Amplifier with operating mode 4». Depending on the analogue input 1 (voltage or current, refer to type code), solenoid A is driven, and depending on the analogue input 2 (voltage or current, refer to type code), solenoid B is driven. (0...10 V, 0...20 mA, 4...20 mA respectively correspond to 0...100% command value signal) / (0...100% preset value signal correspond to I_{min} ... I_{max} solenoid).

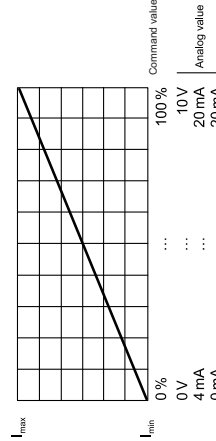


Analogue input 1: Solenoid A

Analogue input 2: Solenoid B

Operating mode 5: Command value unipolar (2-sol. with DigInp2)

This operating mode is only selectable in case of the 2-solenoid version. Depending on a unipolar analogue input (voltage or current), solenoid A is driven, when the digital input 2 «is not activated», resp. solenoid B, when the digital input 2 is «activated». (0...10 V, 0...20 mA, 4...20 mA respectively correspond to 0...100% command value signal) / (0...100% command value signal correspond to I_{min} ... I_{max} solenoid).



Solenoid A, when the digital input 2 is on «not activated»

Solenoid B, when the digital input 2 is on «activated»

Command value inputs

The analogue signal present is digitalised in the 10-bit A/D -converter.

Attention:

When selecting the range 4...20 mA, the resolution is <10-bit! All preset value inputs are executed as differential inputs. Differential inputs are utilised, when the potential of the mass of the external command value transmitter does not coincide with the potential of the mass on the «SD6»-electronics card. If the differential input is to be utilised like an analogue input against mass, then the - (minus) connection of the differential input has to be connected to mass.

Cable-break protection at command value inputs

The current analogue inputs can be monitored for cable-break. If a cable-break is detected, the solenoid output is blocked (disabled) and the output «Error» is activated. For the monitoring to be effective, the following conditions have to be fulfilled:

- The input signal has to be a current signal 4...20 mA.
- The cable-break monitoring has to be activated.

Attention:

Approx. 100 ms pass until a cable break is identified. During this time period, the connected hydraulic system can make unintended movements or change unintended forces.

Analogue input voltage

Input voltage range 0...±10 V
If in case of the version 12 VDC, the stabilised voltage (0...8 V) is utilised, then in the PASO-«SD6» the scaling [%/V] has to be correspondingly adapted.

Analogue input current

Input current range 0...20 mA / 4...20 mA

Digital input 1 «Enable controls»

Enables the «SD6»-electronics in general. Without this enabling, no solenoid current is output. The digital input 1 as standard setting is high-active (refer to electrical characteristic values).

Digital input 2 «Solenoid B»

In the operating mode 5 «Preset value unipolar (2-sol. with DigInp2)», the solenoid B is active, when the digital input 2 is «active». When the digital input 2 is «inactive», then solenoid A is active.

Digital output 1 «Error» or «Solenoid A active»

The function of the digital output 1 with the parameterisation software PASO-DSV/SD6 can be set to «Error» or «Solenoid A active». In the case of «Error» this output becomes active, when an error is detected. Once detected, an error is indicated for as long as the «SD6»-electronics is blocked (disabled) and then enabled again through the digital input «Enable control». In the case of «Solenoid A active», this output becomes active, when the solenoid A is driven. The digital output is a low-side switch (refer to electrical characteristic values).

Digital output 2 «Solenoid B active»

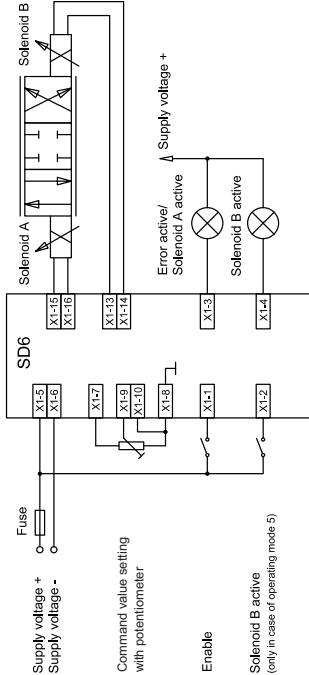
The digital output 2 only has significance in case of the 2-solenoid version. This output becomes active, when the solenoid B is driven. The digital output is a low-side switch (refer to electrical characteristic values).

Ramps

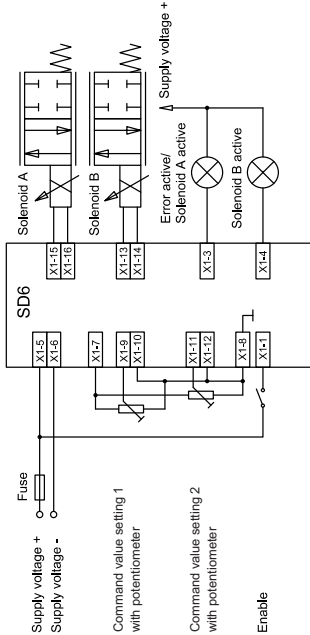
Per solenoid two linear ramps for up and down are separately settable.

CONNECTION EXAMPLE (digital amplifier module with analogue interface)

Operating mode 2, 3 and 5



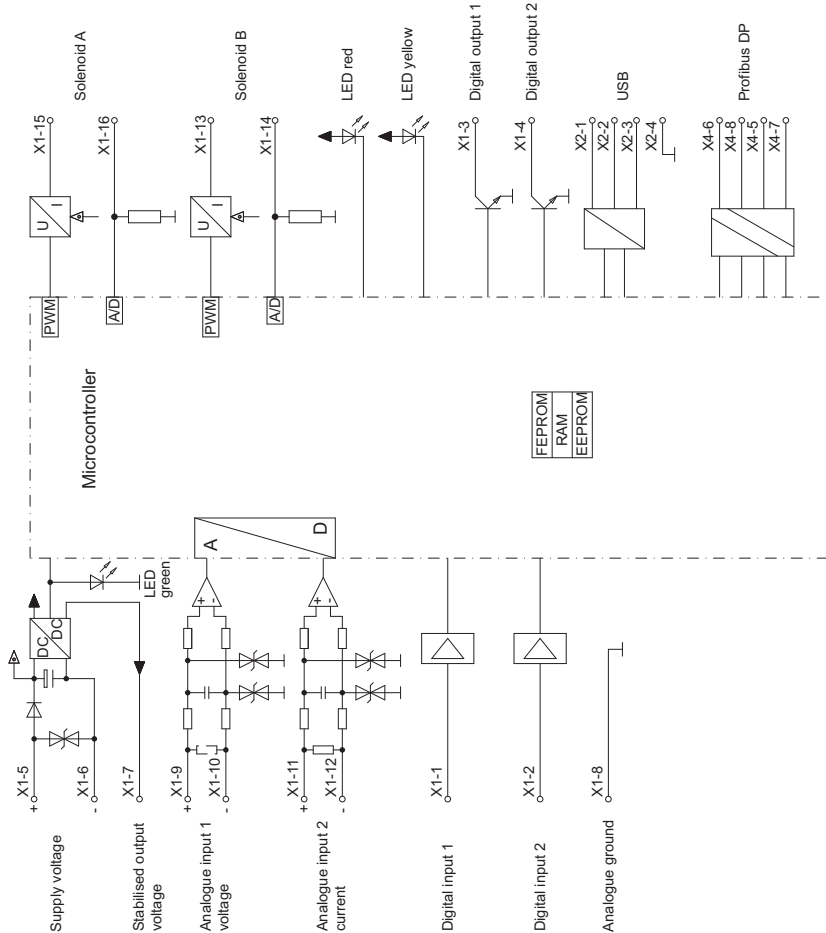
Operating mode 4 (Command value inputs: Fixed, both voltage)



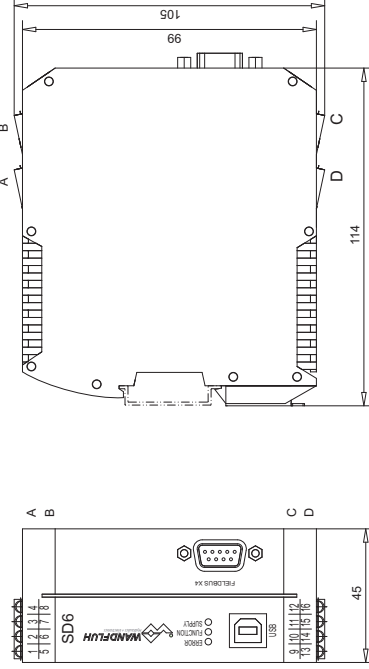
Amplifier with Profibus DP-interface

ELECTRICAL SPECIFICATIONS	
Protection class	IP30 acc. to EN 60 529
Device receptacle	DSUB, 9-poles
Profibus (female)	Plug (male)
Mating connector	DSUB, 9-poles
Supply voltage	24 VDC or 12 VDC
Voltage range:	21...30 V
• 24 VDC	10.5...15 V
• 12 VDC	<10% slow
Ripple on supply vol.	approx. 50 mA
Fuse	no-load current +1.8 A per solenoid (with 24 VDC)
Current consumption:	no-load current +2.3 A per solenoid (with 12 VDC)
• No-load current	Selectable with software
• Maximum current consumption	Diff. inputs not galvanically separated, for earth potential differences up to 1.5 V
Command value signal:	4...+20 mA/0...+20 mA
	0...+10 V (1- or 2-solenoid version)
	-10...+10 V (only 2-solenoid version, not with integrated solenoids)
Input resistance	Voltage input >18 kΩ
Stabilised output voltage	Load for current input = 250 Ω
	10 VDC (with version 24 VDC)
	8 VDC (with version 12 VDC)
	max. load 30 mA
Profibus interface	D-Sub-Plug-in coupling DSUB, 9-poles, female on front plate, differential signal transmission
Bus topology	Line
Potential separation:	Profibus to «SD6»-electronics 500 VDC
Solenoid current:	Adjustable 0...950 mA
• Minimal current I_{min}	Factory-preset 150 mA
• Maximal current I_{max}	Adjustable I_{min} ...1.8 A (with 24 VDC)
	I_{min} ...2.3 A (with 12 VDC)
	Factory-preset 700 mA
• Accumulated current limitation	In operation mode 4, the total solenoid current of simultaneously powered solenoids depends on the ambient temperature. Further information can be found in the operating instructions.
Dither	Frequency-preset 100 Hz
	Amplitude adjustable 20...500 Hz
	Factory-preset 100 mA
	Amplitude adjustable 0...400 mA
	Factory-preset 100 mA
	<1% at $\Delta T = 40^\circ C$
Temperature drift	Switching threshold high 6...30 VDC
Digital inputs	Switching threshold low 0...1 VDC
	Signal active at 6...30 VDC (active high)
	On request:
	Signal active at 0...1 VDC (active low)
Digital outputs	Low-Side-Switch:
	$U_{max} = 40 VDC$
	$I_{max} = -700 mA$
	0...500 s
Ramps adjustable	USB (receptacle type B)
Serial interface	to set parameters with «PASO»
EMV	EN 61 000-6-2
Immunity	EN 61 000-6-4
Emission	

BLOCK DIAGRAM

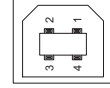


DIMENSIONS



CONNECTOR WIRING DIAGRAM/PIN ASSIGNMENT

USB-interface, USB Type B X2

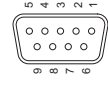


- 1 = VBUS
- 2 = D-
- 3 = D+
- 4 = GND

REMARK!

The parameterisation cable is not part of the scope of supply (commercially available USB-cable, plug type A to plug type B)

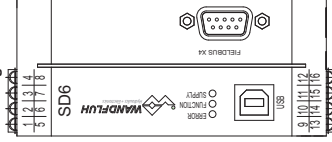
Device receptacle Profibus (female) X4



- 1 = Reserved
- 2 = Reserved
- 3 = RxD/TxD-P
- 4 = Reserved
- 5 = DGND
- 6 = Reserved
- 7 = Reserved
- 8 = RxD/TxD-N
- 9 = Reserved

The mating connector (plug male, DSUB, 9-poles) is not included in the delivery.

PIN-assignment X1



- 1 = Digital input 1
- 2 = Digital input 2
- 3 = Digital output 1
- 4 = Digital output 2
- 5 = Supply Analogue input +
- 6 = Supply voltage 0 VDC
- 7 = Stabilised output voltage
- 8 = Analogue ground
- 9 = Analogue input 1 +
- 10 = Analogue input 1 -
- 11 = Analogue input 2 +
- 12 = Analogue input 2 -
- 13 = Output solenoid B +
- 14 = Output solenoid B -
- 15 = Output solenoid A +
- 16 = Output solenoid A -

Configuration Analogue input

Type description	Analogue input 1	Analogue input 2
SD630 .D .0-AB	Voltage	Current
SD6312D .1-AB	Voltage	Voltage (0...10 V only)
SD6312D .2-AB	Current	Current

ADDITIONAL INFORMATION

Wandfluh documentation	register	1.13
Wandfluh electronics general	register	1.13
Accessories	register	1.10
Proportional directional valves	register	2.3
Proportional pressure valves	register	2.6
Proportional flow control valves	register	2.6

START-UP

Information regarding installation and commissioning are contained in the information leaflet supplied with the amplifier module and in the operating instructions.

Additional information can be found on our website:

«www.wandfluh.com»

Free-of-charge download:

- «PASO-DSV/SD6» Parameterisation software
- Operating instructions (*.pdf)
- OSD File «WAGOB8E.gsd»

DESCRIPTION of «SD6»-Electronics with Profibus DP-Interface

Design

The amplifier module can be parameterised by means of the parameterisation software «PASO-DSV/SD6» through the USB-interface. In addition, the parameterisation software makes a data analysis possible. The software «PASO-DSV/SD6» is supported by Windows 2000 and Windows XP.

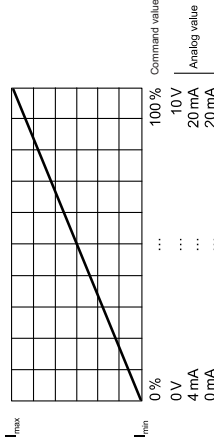
Description of Function

Hardware-Configuration with Profibus DP-interface

The amplifier module SD6 serves for driving proportional valves and has one (in the case of the 1-solenoid version) or two (in the case of the 2-solenoid version) Pulse-Width-Modulated current outputs with superimposed diifer signal, whereby the diifer frequency and the diifer level can be set separately. In the case of the 1-solenoid version, the command value can be input in a range of 0...10 V (voltage input), 0...20 mA, resp. 4...20 mA (current input) or applied through the field bus DP. In case of the 2-solenoid version, the command value can be input in the range of 0...10 V, resp. 0...±10 V (voltage input) or 0...20 mA, resp. 4...20 mA (current input) or applied through the field bus DP. The amplifier module furthermore has two digital inputs for the enabling and the changeover from solenoid A to solenoid B, as well as two digital outputs for «Error detection» or «Solenoid A active» (reversible) and «Solenoid B active». The parameterisation takes place through the parameterisation software «PASO-DSV/SD6» and optionally through a manual parameterisation interface. Changed parameters are stored in a non-volatile memory, so that they are available again after a renewed switching-on of the control system.

Operating mode 1: Command value unipolar (1-sol.)

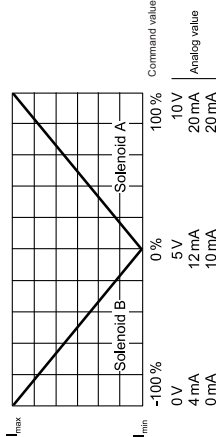
This operating mode is only selectable in case of the 1-solenoid version. In dependence of a unipolar analogue input (voltage or current), the solenoid is driven. (0...10 V, 0...20 mA, 4...20 mA respectively correspond to 0...100% preset value signal) / (0...100% preset value signal correspond to I_{min} ... I_{max} solenoid).



Optionally the amplifier module is equipped with a manual control, which enables the setting of the most important parameters by means of a rotary selector switch and push-buttons and therefore makes a commissioning of the amplifier module possible without a PC.

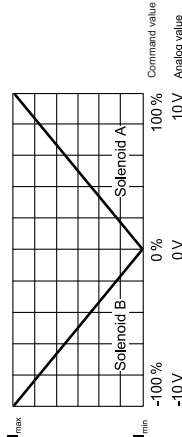
Operating mode 2: Command value unipolar (2-sol.)

This operating mode is only selectable in case of the 2-solenoid version. In dependence of a unipolar analogue input (voltage or current), depending on the signal level solenoid A or solenoid 2 is driven. The changeover threshold between the two solenoids as standard setting is in the middle of the values range of the analogue signal. (0...10 V, 0...20 mA, 4...20 mA respectively correspond to -100%...+100% of the preset value signal) / (<100...0% preset value signal correspond to I_{max} ... I_{min} solenoid B and 0...100% preset value signal correspond to I_{min} ... I_{max} solenoid A).



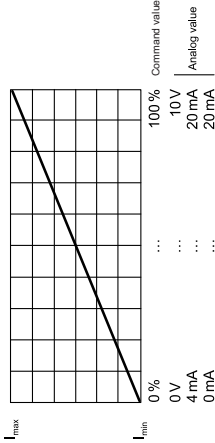
Operating mode 3: Command value bipolar (2-sol.)

This operating mode is only selectable in case of the 2-solenoid version. In dependence of a bipolar analogue input (voltage), depending on the signal level solenoid A or solenoid B is driven. The changeover threshold between the two solenoids as standard setting is at 0 V. (-10...+10 V correspond to -100%...+100% preset value signal) / (-100...0% preset value signal correspond to I_{max} ... I_{min} solenoid B and 0...100% preset value signal correspond to I_{min} ... I_{max} solenoid A).



Operating mode 4: Command value unipolar (2-sol. single)

(2-solenoid version)
In this operating mode every solenoid output can be driven by a command value of its own (refer to connection example «Operating mode 4»). This operating mode is only selectable in case of the 2-solenoid version with the option «Amplifier with operating mode 4». Depending on the analogue input 1 (voltage or current, refer to type code), solenoid A is driven, and depending on the analogue input 2 (voltage or current, refer to type code), solenoid B is driven. (0...10 V, 0...20 mA, 4...20 mA, respectively correspond to 0...100% preset value signal) / (0...100% preset value signal correspond to I_{min} ... I_{max} solenoid).

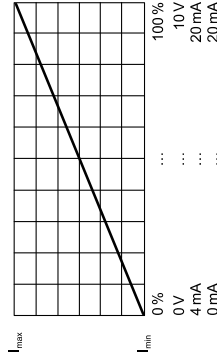


Analogue input 1: Solenoid A

Analogue input 2: Solenoid B

Operating mode 5: Command value unipolar (2-sol. with DigInp2)

(2-solenoid version)
This operating mode is only selectable in case of the 2-solenoid version. Depending on a unipolar analogue input (voltage or current), solenoid A is driven, when the digital input 2 «is not activated», resp. solenoid B, when the digital input 2 is «activated». (0...10 V, 0...20 mA, 4...20 mA respectively correspond to 0...100% preset value signal) / (0...100% command value signal correspond to I_{min} ... I_{max} solenoid).



Solenoid A, when the digital input 2 is on «not activated»

Solenoid B, when the digital input 2 is on «activated»

Command value inputs

The analogue signal present is digitalised in the 10-bit A/D - converter.

Attention:

When selecting the range 4...20 mA, the resolution is <10-bit! All preset value inputs are executed as differential inputs. Differential inputs are utilised, when the potential of the mass of the external preset value transmitter does not coincide with the potential of the mass on the «SD6»-electronics card. If the differential input is to be utilised like an analogue input against mass, then the - (minus) connection of the differential input has to be connected to mass.

Cable-break protection at preset value inputs

The current analogue inputs can be monitored for cable-break. If a cable-break is detected, the solenoid output is blocked (disabled) and the output «Error» is activated. For the monitoring to be effective, the following conditions have to be fulfilled:

- The input signal has to be a current signal 4...20 mA.
- The cable-break monitoring has to be activated.

Attention:

Approx. 100 ms pass until a cable break is identified. During this time period, the connected hydraulic system can make unintended movements or change unintended forces.

Analogue input voltage

Input voltage range 0...±10 V, analogue input 2: 0...10 V.
If in case of the version 12 VDC, the stabilised voltage (0...8 V) is utilised, then in the PASO-«SD6» the scaling [%/V] has to be correspondingly adapted.

Analogue input current

Input current range 0...20 mA / 4...20 mA

Digital input 1 «Enable controls»

Enables the «SD6»-electronics in general. Without this enabling, no solenoid current is output. The digital input 1 as standard setting is high-active (refer to electrical characteristic values).

Digital input 2 «Solenoid B»

In the operating mode 5 «Preset value unipolar (2-sol. with DigInp2)», the solenoid B is active, when the digital input 2 is «active». When the digital input 2 is «inactive», then solenoid A is active.

The digital inputs 1–2 can only be utilised with local device control (db.local=1).

Digital output 1 «Error» or «Solenoid A active»

The function of the digital output 1 with the parameterisation software PASO-DSV/SD6 can be set to «Error» or «Solenoid A active». In the case of «Error» this output becomes active, when an error is detected. Once detected, an error is indicated for as long as the «SD6»-electronics is blocked (disabled) and then enabled again through the digital input «Enable control». In the case of «Solenoid A active», this output becomes active, when the solenoid A is driven. The digital output is a low-side switch (refer to electrical characteristic values).

Digital output 2 «Solenoid B active»

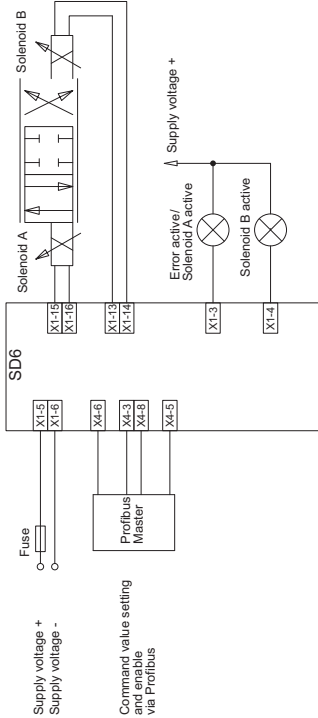
The digital output 2 only has significance in case of the 2-solenoid version. This output becomes active, when the solenoid B is driven. The digital output is a low-side switch (refer to electrical characteristic values).

Ramps

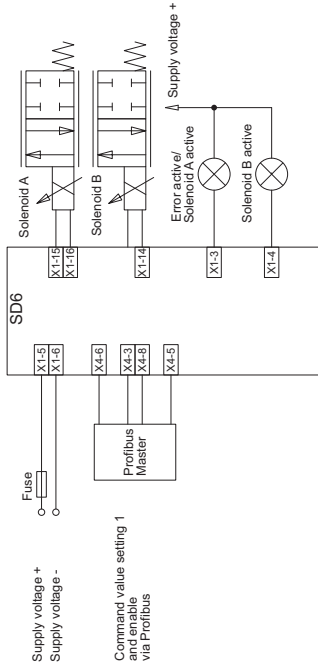
Per solenoid two linear ramps for up and down are separately settable.

CONNECTION EXAMPLE (Digital amplifier module with Profibus DP-Interface)

Operating mode 2, 3 and 5



Operating mode 4 (Command value inputs: Fixed, both voltage)

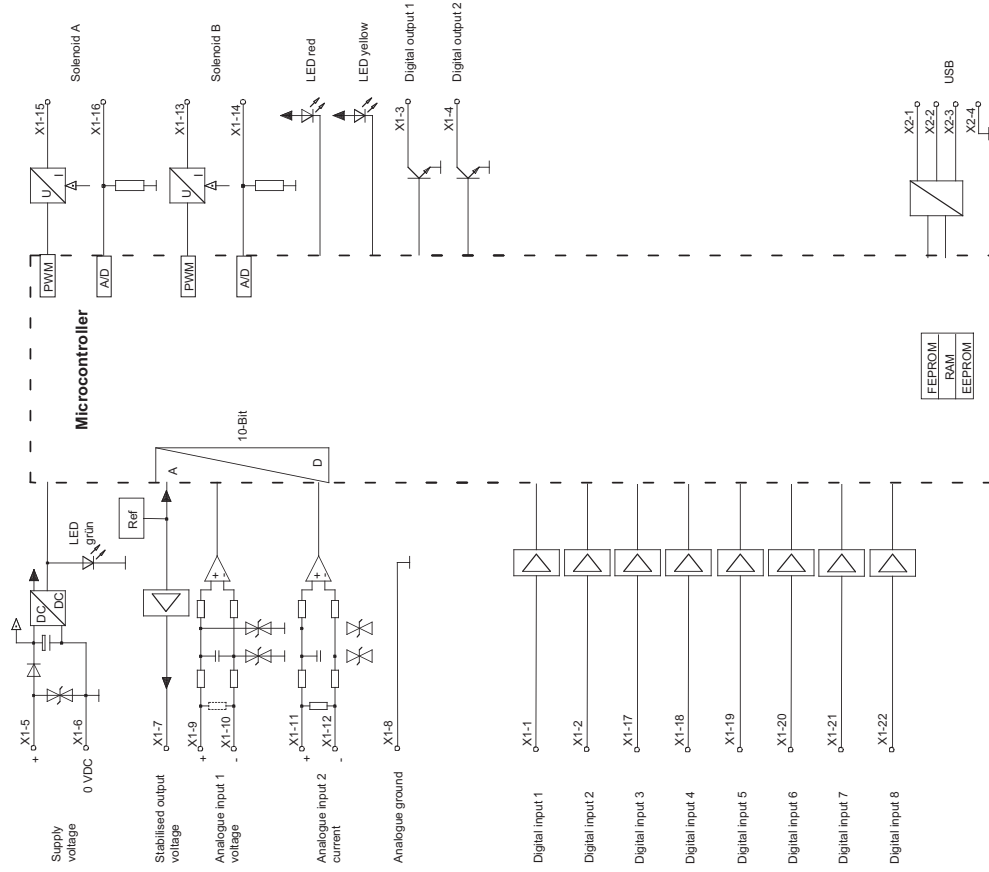


Amplifier with analogue interface and fixed command values

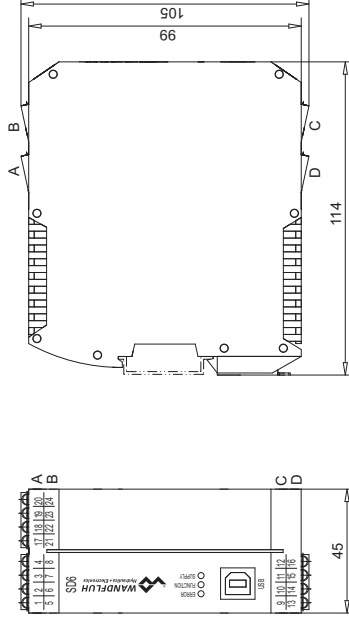
ELECTRICAL SPECIFICATIONS

Protection class	IP30 acc. to EN 60 529	Solenoid current:	Adjustable 0...950 mA
Supply voltage	24 VDC or 12 VDC	• Minimal current I_{min}	Factory-preset 150 mA
Voltage range:		• Maximal current I_{max}	Adjustable $I_{min} \dots 1,8 A$ (with 24 VDC) $I_{min} \dots 2,3 A$ (with 12 VDC)
• 12 VDC	21...30 V		
• 24 VDC	10,5...15 V		
Ripple on supply vol.	<10% slow		
Fuse	ca. 40 mA	Dither	Factory-preset 700 mA Frequency adjustable 20...500 Hz Factory-preset 100 Hz Amplitude adjustable 0...400 mA Factory-preset 100 mA <1% at $\Delta T = 40^\circ C$
Current consumption:		Temperature drift	Switching threshold high 6...30 VDC Switching threshold low 0...1 VDC
• No-load current	no-load current +1,8 A per solenoid (with 24 VDC) no-load current +2,3 A per solenoid (with 12 VDC)	Digital inputs	Signal active at 6...30 VDC (active high) On request: (digital input 1 + 2) Signal active at 0...1 VDC (active low)
• Maximum current consumption	Selectable with software Diff. inputs not galvanically separated, for earth potential differences up to 1,5 V 4...+20 mA/0...+20 mA 0...+10 V (1- or 2-solenoid version) -10...+10 V (only 2-solenoid version)	Digital outputs	Low-Side-Switch: $U_{max} = 40 VDC$ $I_{max} = 700 mA$ $I_{max} = 500 s$
Preset value signal:	Voltage input >18 k Ω Load for current input = 250 Ω 10 VDC (with version 24 VDC) 8 VDC (with version 12 VDC) max. load 30 mA	Ramps adjustable	USB (receptacle type B) to set parameters with «PASO»
Input resistance		Serial interface	EN 61 000-6-2 EN 61 000-6-4
Stabilised output voltage		EMV	Immunity Emission

BLOCK DIAGRAM

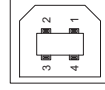


DIMENSIONS



CONNECTOR WIRING DIAGRAM/PIN ASSIGNMENT

USB-interface, USB Type B X2



1 = VBUS
2 = D-
3 = D+
4 = GND

PIN-assignment X1

- 1 = Digital input 1
- 2 = Digital input 2
- 3 = Digital output 1
- 4 = Digital output 2
- 5 = Supply Analogue input +
- 6 = Supply voltage 0 VDC
- 7 = Stabilised output voltage
- 8 = Analogue ground
- 9 = Analogue input 1 +
- 10 = Analogue input 1 -
- 11 = Analogue input 2 +
- 12 = Analogue input 2 -
- 13 = Output solenoid B +
- 14 = Output solenoid B -
- 15 = Output solenoid A +
- 16 = Output solenoid A -
- 17 = Digital input 3
- 18 = Digital input 4
- 19 = Digital input 5
- 20 = Digital input 6
- 21 = Digital input 7
- 22 = Digital input 8
- 23 = reserved
- 24 = reserved



REMARK!

The parameterisation cable is not part of the scope of supply (commercially available USB-cable, plug type A to plug type B)

START-UP

Information regarding installation and commissioning are contained in the information leaflet supplied with the amplifier module and in the operating instructions.

Additional information can be found on our website:

«www.wandfluh.com»

Free-of-charge download:

- «PASO-DSV/SD6» Parameterisation software
- Operating Instructions (*.pdf)

ADDITIONAL INFORMATION

Wandfluh electronics general Accessories	Wandfluh documentation register
Proportional directional valves	1.13
Proportional pressure valves	1.10
Proportional flow control valves	2.3
	2.6

Configuration Analogue input

Type description	Analogue input 1 voltage	Analogue input 2 current
SD632.D. 0-AA		

DESCRIPTION of «SD6»-electronics with analog interface and fixed command values

Design

The amplifier module can be parameterised by means of the parameterisation software «PASO-DSV/SD6» through the USB-interface. In addition, the parameterisation software makes a data analysis possible. The software «PASO-DSV/SD6» is supported by Windows 2000 and Windows XP.

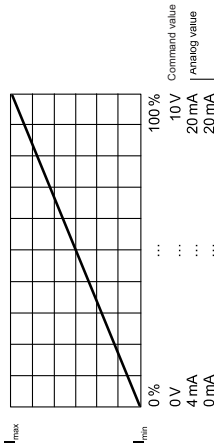
Description of Function

Hardware-Configuration with Analogue Signal

The amplifier module SD6 serves for driving proportional valves and has one (in the case of the 1-solenoid version) or two (in the case of the 2-solenoid version) Pulse-Width-Modulated current outputs with superimposed dither signal, whereby the dither frequency and the dither level can be set separately. In the case of the 1-solenoid version, the preset value can be input in a range of 0...10 V (voltage input) or 0...20 mA, resp. 4...20 mA (current input). In the case of the 2-solenoid version, the preset value can be input in the range of 0...10 V, resp. 0...10 V (voltage input) or 0...20 mA, resp. 4...20 mA (current input). The command value can also be internally set instead of the external analogue signal and called-up through three digital inputs. With this, in total seven „fixed command values“ are available, which can be selected by means of binary coding. The amplifier module furthermore has five digital inputs for the enabling, the changeover from solenoid A to solenoid B and a blocking of the ramping function as well as two digital outputs for „Error detection“ or „Solenoid A active“ (reversible) and „Solenoid B active“. The parameterisation takes place through the parameterisation software «PASO-DSV/SD6». Changed parameters are stored in a non-volatile memory, so that they are available again after a renewed switching-on of the control system.

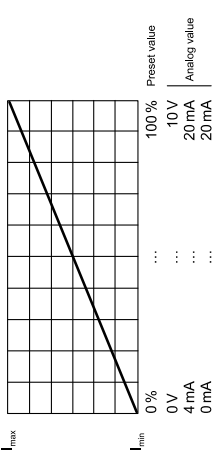
Operating mode 1: Command value unipolar (1-sol.)

This operating mode is only selectable in case of the 1-solenoid version. In dependence of a unipolar analogue input (voltage or current), the solenoid is driven. (0...10 V, 0...20 mA, 4...20 mA respectively correspond to 0...100% preset value signal)/(0...100% preset value signal correspond to I_{min} ... I_{max} solenoid).



Operating mode 5: Command value unipolar (2-sol. with DigInp4) (2-solenoid version)

This operating mode is only selectable in case of the 2-solenoid version. Depending on a unipolar analogue input (voltage or current), solenoid A is driven, when the digital input 4 is not activated, resp. solenoid B, when the digital input 4 is activated, (0...10 V, 0...20 mA, 4...20 mA respectively correspond to 0...100% preset value signal)/(0...100% preset value signal correspond to I_{min} ... I_{max} solenoid).



Solenoid A, when the digital input 4 is on «not activated»
Solenoid B, when the digital input 4 is on «activated»

Command value inputs

The analogue signal present is digitalised in the 10-bit A/D-converter.

Attention:

When selecting the range 4...20 mA, the resolution is <10-bit. All preset value inputs are executed as differential inputs. Differential inputs are utilised, when the potential of the mass of the external preset value transmitter does not coincide with the potential of the mass on the «SD6»-electronics card. If the differential input is to be utilised like an analogue input against mass, then the – (minus) connection of the differential input has to be connected to mass.

Cable-break protection at preset value inputs

The current analogue inputs can be monitored for cable-break. If a cable-break is detected, the solenoid output is blocked (disabled) and the output «Error» is activated. For the monitoring to be effective, the following conditions have to be fulfilled:

- The input signal has to be a current signal 4...20 mA.
- The cable-break monitoring has to be activated.

Attention:

Approx. 100 ms pass until a cable break is identified. During this time period, the connected hydraulic system can make unintended movements or change unintended forces.

Analogue input voltage

Input voltage range 0...±10 V
If in case of the version 12 VDC, the stabilised voltage (0...8 V) is utilised, then in the PASO-«SD6» the scaling [%/V] has to be correspondingly adapted.

Analogue input current

Input current range 0...20 mA/4...20 mA

Digital input 1 (disable solenoid A)

If the input is set, solenoid output A is disabled.

Digital input 2 (disable solenoid B)

If the input is set, solenoid output B is disabled.

Digital input 3 (enable control)

If the input is set, the solenoid outputs are enabled, if not, they are disabled.

Digital input 4 (solenoid B active)

If a directional valve is commanded by a voltage preset value 0...+10 V or a current preset value, digital input 4 must be set to activate solenoid output B (only in case of operating mode 5).

Digital input 5 (ramp off)

The ramp can be temporarily switched off by setting this input.

Digital inputs 6 to 8 (fixed preset values)

Seven fixed preset values, selectable in binary form, are available. When a fixed preset value is selected via digital inputs 6 to 8, the external preset value is ineffective.

Digital output 1 „Error“ or „Solenoid A active“

The function of the digital output 1 with the parameterisation software PASO-DSV/SD6 can be set to „Error“ or „Solenoid A active“. In the case of „Error“ this output becomes active, when an error is indicated for as long as the „SD6“-electronics is blocked (disabled) and then enabled again through the digital input „Enable control“. In the case of „Solenoid A active“, this output becomes active, when the solenoid A is driven. The digital output is a low-side switch (refer to electrical characteristics values).

Digital output 2 „Solenoid B active“

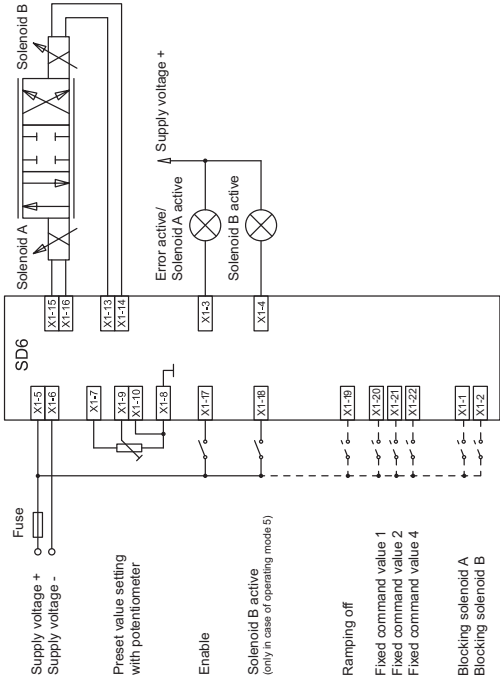
The digital output 2 only has significance in case of the 2-solenoid version. This output becomes active, when the solenoid B is driven. The digital output is a low-side switch (refer to electrical characteristics values).

Ramps

Per solenoid how linear ramps for up and down are separately settable.

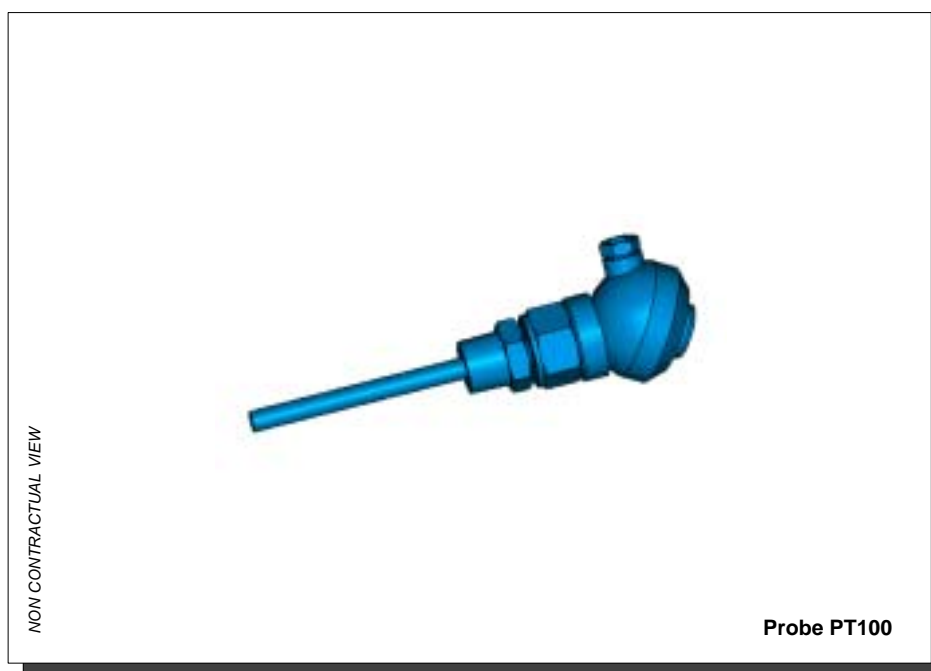
CONNECTION EXAMPLE (digital amplifier module with analogue interface)

Operating mode 2, 3 and 5

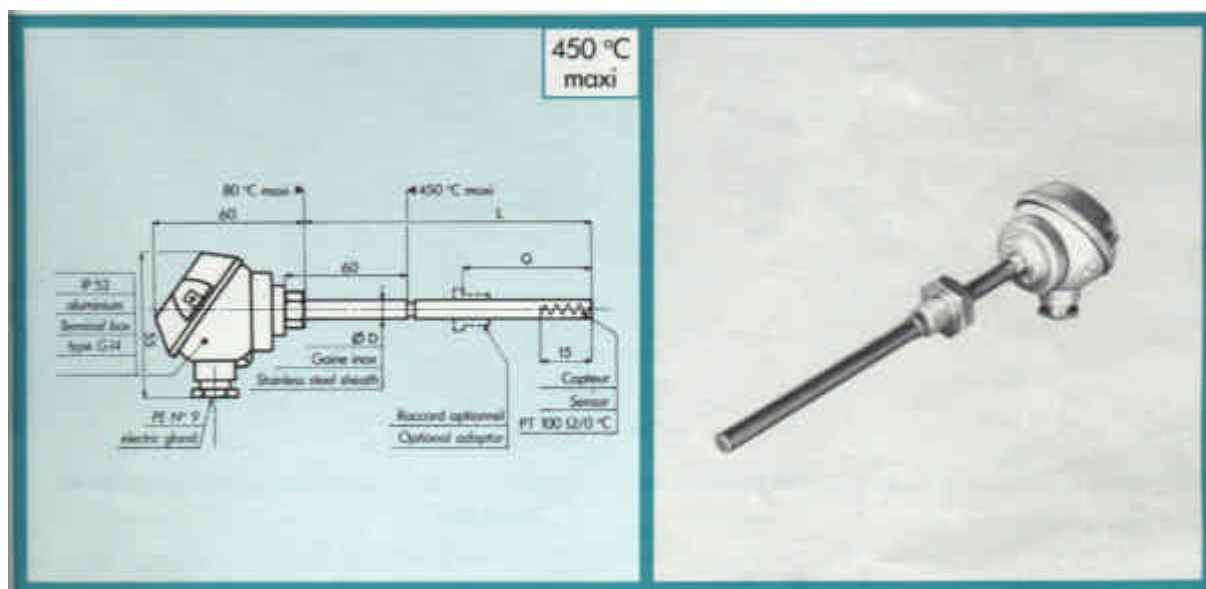


5.18 PROBE PT100 (VULCANIC)

Location	ECL code	Reference
Hydraulic Unit	1-10-732-71	PT100 – 31042-01



TYPE 31042	SONDE PT 100- SORTIE BOITIER DEPORTE RTD SENSOR – OFFSET TERMINAL BOX
-----------------------------	--



DESCRIPTION:

Sonde PT 100 avec gaine étanche en inox et sortie sous boîtier aluminium miniaturisé. Modèle simple 3/4 bornes ou duplex 4 bornes. Classe de précision

A ou B selon NFC42330. Fixation par raccord optionnel serti, brasé ou soudé arc sur gaine, ou par raccord bicône coulissant (accessoire).

DESCRIPTION:

PT 100 sensor with sealed stainless steel sheath and output in miniaturized aluminium case. Single 3/4 terminal or 4 terminal duplex model. Accuracy class A or B according to NF C42330. Attachment by optional crimp-on union, brazed or arc-welded onto sheath, or by sliding 3 piece union (accessory).

CARACTÉRISTIQUES:

CHARACTERISTICS:

Précision selon NF		Standard class B or optional Class A			Accuracy according to NF	
$f D$ (mm)		4.5	6	8	$f D$ (mm)	
Matière de la gaine		AISI 316L	AISI 321	AISI 321	Sheat metal	
Sonde simple	3 bornes	*	*	*	3 terminals	Single sensor
	4 bornes	*	*	*	4 terminals	
Sonde duplex	4 bornes		*	*	4 terminals	Double sensor
L mini(mm)		100			L mini (mm)	
L maxi (mm)		400	900	900	L maxi (mm)	
G (mm)		From 40 up to L – 10			G (mm)	
Fixation du raccord	Serti	*	*	*	Crimped	Adaptor fitting
	Brasé	*	*	*	Brazed	
	Soudé		*	*	soldered	

EXEMPLE DE DÉSIGNATION:

Sonde platine duplex type 31042 classe B, avec gaine $f D = 8$ mm longueur $L = 600$ mm. Sortie 6 bornes sous boîtier aluminium type G14. Equipée d'un raccord Réf. 31560-00 serti à $G = 500$ mm de l'extrémité.

EXAMPLE OF DESCRIPTION:

Duplex platinum sensor type 31042 class B, with sheath $f D = 8$ mm length $L = 600$ mm. 6 terminal output in aluminium case type G 14. Provided with union Ref. 31560-00 crimped on at $G = 500$ mm from end.

DOCUMENT TECHNIQUE	BRU	DT19/23
--------------------	-----	---------

5.19 LEVEL SWITCH NWS (KOBOLD)

Location	ECL code	Reference
Hydraulic Unit	1-10-795-28	RCM 4033 L250
	1-10-795-25	RCM 4033
	1-10-887-11	RCM 4013



Level Switch

Tuning Fork Principle



measuring
•
monitoring
•
analysing



- Repeatability: ± 1 mm
- pmax: 50 bar
tmax: 130°C,
150°C (for CIP cleaning)
- Connections:
sanitary connection, NPT,
flange, hygienic connection
- Material:
stainless steel 1.4404
- Viscosity: max. 5000 mm²/s
- no moving parts
- Insensitive to plant vibrations



KOBOLD offices exist in the following countries:

ARGENTINA, AUSTRIA, BELGIUM, BRAZIL, CANADA,
CHINA, FRANCE, GREAT BRITAIN, ITALY, NETHERLANDS,
POLAND, SWITZERLAND, USA, VENEZUELA

KOBOLD Messing GmbH
Nordring 22-24
D-65719 Hofheim/Is.
☎ (06192) 299-0
☎ (06192) 233-96
Internet: www.kobold.com

Model:
NWS

Level Switch According to the Tuning Fork Principle Model NWS



Technical Details

Housing:
glass-fibre-reinforced nylon, orange,
black cover with window,
housing 330° rotatable

Process connections:

R 3/4, R 1
3/4 NPT, 1 NPT
Tri Clamp
Sanitary connection DIN 11851
Aseptic connection DIN 11864
DRD-flange
Flange B 25 PN 40 DIN 2527
Flange B 50 PN 40 DIN 2527
Flange ASME B 16.5-1", 300 lbs
Flange ASME B 16.5-2", 300 lbs
st. steel 316 (for example: 1.4404)

Sensor material:

Protection:
IP 66/IP 67

Max. operat. pressure:
50 bar between -40°C and +50°C
45 bar at 130°C

Flanges: see pressure-steps

Max. operating temp.:
130°C medium temperature
(150°C CIP)

Power supply:
24 V to 240 V_{ac} or V_{dc} (50/60 Hz)

Cable gland:
M16 x 1.5

Terminals:
max. 1.5 mm² (26-14 AWG)

Loading capacity:
0.5 A max. (5 A for 40 ms)

Min. switching current:
7.5 mA

OFF-state
leakage current:

< 2 mA constant

approx. 6 V

Voltage drop:
1 sec wet/dry

Delay:
1 sec dry/wet

Viscosity:
5000 mm²/sec. max. at 25°C

(response time can be increased)

Hysteresis:
4 mm vertical, 1 mm horizontal

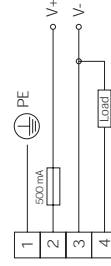
Repeatability:
 ± 1 mm

Weight:
0.5 kg (for R 3/4 and 3/4 NPT)

Electrical connection

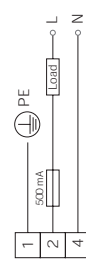
3-wire SPS/PLC

24 V_{ac}



2-wire serial load

24-240 V_{ac}/V_{dc}



Description

The KOBOLD liquid level switch NWS is designed as a 2 and 3-wire switch and can be universally used in vessels and pipelines. The NWS operates on the tuning fork principle in air at resonance frequency. A piezoelectric crystal is used for excitation of oscillations and for monitoring the actual oscillation frequency. When the fork is immersed in liquid, the frequency changes: this change is detected electronically and the output signal is changed. The NWS operates as a two-wire switch in series with the load. The simple electronic switch is operated by the liquid. The NWS can also be connected to a PLC through a third terminal.

Special features

The NWS does have output status indication with an LED that can be viewed through a lens on the cover. The LED flashes about once a second when the NWS has switched off and is permanently illuminated when the NWS is switched on. The LED is an optical confirmation that the NWS is working correctly and the condition of the wet side is correctly displayed. The NWS can be set as upper or lower limiter with a mode selector.

Applications

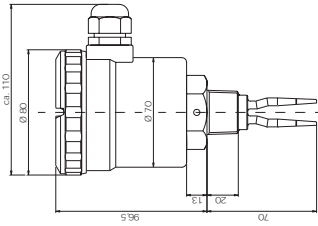
- Oils
- Water
- Paints and transparent inks
- Sauces
- Milk
- Carbonated liquids
- Foamed oils

The NWS is ideal for hygienic and sterile applications and for CIP cycles up to 150°C.

Dimensions

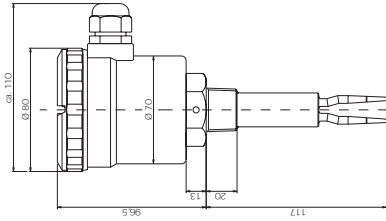
Connection: R 3/4 male, 3/4 NPT male

NWS-R 20 20 0
NWS-N 20 20 0



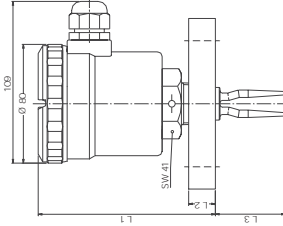
Connection: R 1 male, 1 NPT male

NWS-R 25 20 0
NWS-N 25 20 0



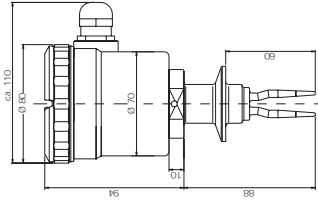
Connection: DIN-flange, ASME-flange

NWS-F 25...
NWS-F 50...
NWS-A 25...
NWS-A 50...



Connection: Tri Clamp

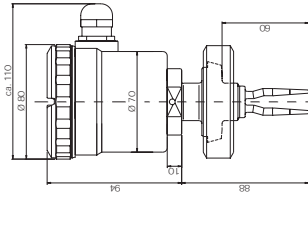
NWS-T 40 20 0
NWS-T 50 20 0



	L 1	L 2	L 3
DN 25 / PN 40	approx. 119.5	18	approx. 47
DN 50 / PN 40	approx. 119	20	approx. 95
ASME 1" 300 lbs	approx. 125.5	17.5	approx. 41
ASME 2" 300 lbs	approx. 121	22.4	approx. 92

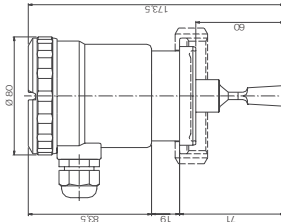
Connection: Sanitary connection accord. DIN 11851

NWS-L 40 20 0
NWS-L 50 20 0



Connection: Aseptic-connection accord. DIN 11864

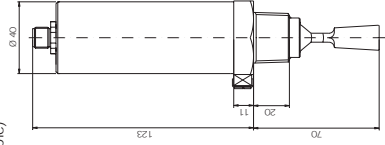
NWS-H 50...



Namur with plug connection

(all connections are possible)

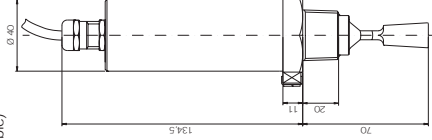
NWS-...2NO
NWS-...230



Namur with cable connection

(all connections are possible)

NWS-...2KO



Order details (Example: NWS-R20 230)

Connection	Order No.	Power supply	Version with sensor
R 3/4 male	NWS-R20...		
R 1 male	NWS-R25...*		
3/4 NPT male	NWS-N20...		
1 NPT male	NWS-N25...*		
DIN-flange DN 25	NWS-F25...		
DIN-flange DN 50	NWS-F50...*	20 = 24 V...240 V _{DC} / AC	0= compact
1" ASME-flange	NWS-A25...	23 = 24 V _{DC} ± 20%	3= 300 mm sensor length
2" ASME-flange	NWS-A50...*	2N= Namur; connector M12x1	5= 500 mm sensor length
Tri Clamp DN 40	NWS-T40...	2K= Namur; 1.5 m cable (blue)	Y=Special sensor length (up to 3m) to be specified
Tri Clamp DN 50	NWS-T50...		
Sanitary conn. DN 40 (DIN 11851)	NWS-L40...		
Sanitary conn. DN 50 (DIN 11851)	NWS-L50...		
Aseptic conn. DN 50 (DIN 11864)	NWS-H60...		
DRD Ø 125 mm flange	NWS-D12...		
Special connection	NWS-YYY...		

*only the marked models are available with longer sensor lengths (...3 ...5 ...y)

5.20 LEVEL SWITCH FSA (HYDAC)

Location	ECL code	Reference
Hydraulic Unit	0-00-241-39	127.2.1/12



Indicateur de niveau Contrôleur de niveau Thermocontacteur FSA / FSK / TSE

Taille: jusqu'à 381
Pression nominale: jusqu'à 0,5 bar
Température: jusqu'à 80 °C

1.

DESCRIPTION
- 1.1.

GENERALITES
- Les indicateurs de niveau FSA, les contrôleurs de niveau FSK et thermocontacteurs TSE HYDAC sont des éléments assurant l'affichage et le contrôle de niveau des fluides hydrauliques. Grâce à une gamme de produits modulaires, nous pouvons proposer les différentes combinaisons suivantes:
 - FSA: 5 tailles avec échelonnement régulier
 - Thermomètre optique avec graduation en °C et °F
 - Sonde thermométrique pour la surveillance de la température de l'huile dans le réservoir hydraulique, avec affichage en °C. Affichage en °C et °F sur demande.
 - Montage aisé car standardisé (FSA/K)
 - FSK: 4 tailles avec échelonnement régulier
 - Thermocontacteur avec au choix un contact ouvrant (type O), fermant (type C) ou inverseur (type W).
 - Sonde thermométrique pour la surveillance de la température de l'huile dans le réservoir hydraulique, avec affichage en °C. Affichage en °C et °F sur demande.
 - Montage aisé car standardisé (FSA/K)
 - TSE: 3 températures nominales au choix: 60 °C, 70 °C et 80 °C.
 - Montage aisé sur FSK et FSA.
 - Montage aisé car standardisé (FSA/K)
 - Traitement anti-corrosion des surfaces.

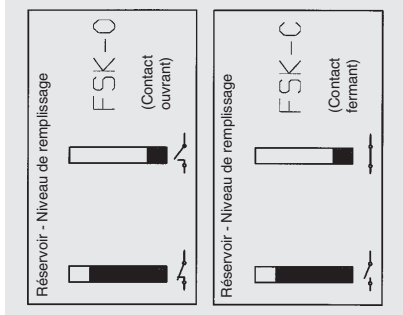
- 1.2.

FONCTIONNEMENT DU FSA
- L'utilisation du FSA HYDAC permet de relever facilement le niveau du fluide hydraulique, par une simple lecture à l'extérieur du réservoir. Le fluide pénètre dans l'appareil par l'orifice inférieur et remplit le tube. Un choix correct de la taille assure le contrôle précis du niveau du fluide.
- Fonctionnement du FSK
- Le FSK assure un contrôle automatique du niveau du fluide par un signal électrique. Ce signal peut être utilisé en tant que signal d'alarme ou pour la régulation du niveau de fluide. Le fluide pénètre dans l'appareil par l'orifice et agit sur le flotteur. Celui-ci est au niveau du fluide dans le réservoir. Lorsque le niveau de fluide baisse, le flotteur génère un signal de commutation. En exécution contact ouvrant (type O), ce signal provoque la fermeture du contact, en exécution contact fermé (type C), ce signal provoque l'ouverture du contact.
- L'exécution contact inverseur (type W) offre deux possibilités. Elle peut être utilisée en contact ouvrant ou en contact fermant.
- FONCTIONNEMENT DU TSE
- Le thermocontacteur TSE HYDAC convient parfaitement en tant qu'option complémentaire pour les FSA et FSK. Il peut toutefois également être utilisé en tant que tel sur des centrales hydrauliques.
- La sonde du thermocontacteur est en contact avec le fluide hydraulique. Le contact s'ouvre, dès que la température nominale est atteinte et le circuit est alors interrompu.
- Ce signal peut être utilisé en tant que signal d'alarme ou pour la surveillance de la température du fluide.
- Le contact redevient passant après une chute d'env. 25 K de la température du fluide.

- 1.3.

APPLICATION
- Les indicateurs de niveau FSA, les contrôleurs de niveau FSK et thermocontacteurs TSE HYDAC sont des éléments assurant l'affichage et le contrôle de niveau des fluides hydrauliques
- Les différents domaines d'application sont :
Machines-outils, construction de centrales hydrauliques, montage sur réservoirs hydrauliques, d'huile de graissage et de coupe, ainsi que sur réducteur ...
- 1.4.

REMARQUE
- La limite max. de viscosité se situe aux environs de 2.000 mm²/s.
- Il n'est pas possible de combiner un thermocontacteur TSE à une sonde thermométrique FT.
- Pour assurer un fonctionnement correct, il est impérativement nécessaire de respecter les indications de pression, viscosité et température.
- FSA/FSK
- Ne peuvent être utilisés avec du glycole ni tout autre fluide contenant du glycole.
- FSK
- Selon le volume de remplissage du réservoir et en fonction de l'exécution du contrôleur de niveau – contact ouvrant ou contact fermant –, on obtient les diagrammes de commutation suivants :



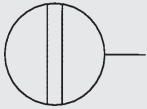
La logique de commutation du contrôleur de niveau est définie à partir d'un réservoir rempli. En exécution contact fermant, l'ouverture du contact est déclenchée dès lors que le niveau du fluide est inférieur au niveau de commutation. En exécution contact ouvrant, la fermeture du contact est déclenchée dès lors que le niveau du fluide est inférieur au niveau de commutation.

2. CARACTERISTIQUES

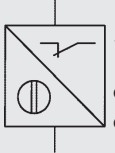
2.1. GENERALITES

2.1.1 Désignation et symbole

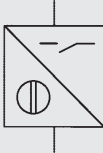
Indicateur de niveau FSA



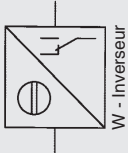
Contrôleur de niveau FSK



O - Ouvrant

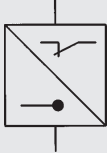


C - Fermant



W - Inverseur

Thermocontacteur TSE



2.1.2 Code de commande FSA

(Exemple de commande)

FSA - 076 - 2 - X / FT200 / 12

Indicateur de niveau

Taille nominale

≡ entre l'axe des vis

076

127

176

254

381

Matériau des joints

2 = Viton (FKM)

1 = Perbunan (NBR)

Série

(Déterminée par le constructeur)

Fonctions complémentaires

- Sans fonction complémentaire

T = Thermomètre intégré au tube

FT 200 = Sonde thermométrique long. 200 mm

FT 300 = Sonde thermométrique long. 300 mm

TSE 60 = Thermocontacteur température nominale 60 °C

TSE 70 = Thermocontacteur température nominale 70 °C

TSE 80 = Thermocontacteur température nominale 80 °C

Conditions d'implantation

Diamètre des vis creuses

M 12 (standard)

M 10 (hors TSE)

Code de commande FSK

(Exemple de commande)

FSK - 127 - 2 - X / O / FT200 / 12 / 3

Contrôleur de niveau

Taille nominale

≡ entre l'axe des vis

127

176

254

381

Matériau des joints

2 = Viton (FKM)

Série

(Déterminée par le constructeur)

Fonction de commutation

O = Contact ouvrant à niveau min.

C = Contact fermant à niveau min.

W = Contact ouvrant et fermant à niveau min.

(connecteur Z4 = standard)

Fonctions complémentaires

- Sans fonction complémentaire

FT 200 = Sonde thermométrique long. 200 mm

FT 300 = Sonde thermométrique long. 300 mm

TSE 60 = Thermocontacteur température nominale 60 °C

TSE 70 = Thermocontacteur température nominale 70 °C

TSE 80 = Thermocontacteur température nominale 80 °C

Conditions d'implantation

Diamètre des vis creuses

M 12 (standard)

M 10 (hors TSE)

Connecteur

sans indication = 3 pôles MPM (standard)

Z4 = 4 pôles Hirschmann

SEW = 4 pôles M12 x 1 (cylindrique)

Code de commande TSE

(Exemple de commande)

TSE - 70 / X / 12

Désignation

TSE Thermocontacteur (pour FSA)

TSE-L Thermocontacteur (pour FSK)

Température nominale

60 °C

70 °C

80 °C

Série

(Déterminée par le constructeur)

Diamètre des vis creuses

M 12

2.1.3 Livraisons préférentielles

Type	Taille nominale ≡ entre l'axe des vis	Code de commande = code article	Poids [kg]
FSA - 076 - 1.X/-/12	76	700 000	0,17
FSA - 076 - 2.X/-/12	76	700 002	0,17
FSA - 127 - 1.X/-/12	127	700 036	0,19
FSA - 127 - 2.X/-/12	127	700 038	0,19
FSA - 176 - 1.X/-/12	176	700 113	0,22
FSA - 176 - 2.X/-/12	176	700 137	0,22
FSA - 254 - 1.X/-/12	254	700 072	0,24
FSA - 254 - 2.X/-/12	254	700 074	0,24
FSA - 381 - 1.X/-/12	381	700 095	0,29
FSA - 381 - 2.X/-/12	381	700 160	0,29

TSE - 60 /X/12	-	703 724	0,11
TSE - 70 /X/12	-	703 714	0,11
TSE - 80 /X/12	-	551 481	0,11

FSK - 127 - 2.X/O/-/12	127	3 070 285	0,21
FSK - 127 - 2.X/C/-/12	127	3 112 276	0,21
FSK - 127 - 2.X/W/-/12/Z4	127	3 112 298	0,21
FSK - 127 - 2.X/O/-/12/SEW	127	3 136 130	0,21
FSK - 176 - 2.X/O/-/12	176	3 112 231	0,23
FSK - 176 - 2.X/C/-/12	176	3 112 299	0,23
FSK - 176 - 2.X/W/-/12/Z4	176	3 112 301	0,23
FSK - 254 - 2.X/O/-/12	254	3 112 302	0,26
FSK - 254 - 2.X/C/-/12	254	3 112 303	0,26
FSK - 254 - 2.X/W/-/12/Z4	254	3 112 305	0,26
FSK - 381 - 2.X/O/-/12	381	3 112 306	0,30
FSK - 381 - 2.X/C/-/12	381	3 112 307	0,30
FSK - 381 - 2.X/W/-/12/Z4	381	3 112 309	0,30

TSE-L - 60 /X/12	-	3 148 887	0,13
TSE-L - 70 /X/12	-	3 148 886	0,13
TSE-L - 80 /X/12	-	3 148 885	0,13
FT 200 0 - 100 °C / M12	200	700 154	0,03
FT 300 0 - 100 °C / M12	300	700 155	0,04

2.1.4 Construction

Tous les appareils sont conçus pour être fixés directement au réservoir de fluide hydraulique.

2.1.5 Type de raccordement

FSA/FSK

La fixation est réalisée par deux vis creuses. Les trous de fixation peuvent être réalisés soit taraudés, soit traversant (Ø 13, Ø 11).

TSE

Le thermocontacteur peut être maintenu en lieu et place de la vis inférieure du FSA/FSK.

2.1.6 Sens de montage

FSA: vertical sur la paroi du réservoir

FSK: vertical sur la paroi du réservoir (connecteur de raccordement vers le fond du réservoir)

TSE: à la place de la vis creuse inférieure (FSA)

TSE-L: à la place de la vis creuse inférieure (FSK)

2.1.7 Poids

(voir tableau 2.1.3)

2.1.8 Sens du débit

Indifférent

2.1.9 Plage de température ambiante

- 20 °C à + 80 °C

2.1.10 Matériaux

FSA/FSK

- Pièces de raccordement et tube en matière synthétique à hautes caractéristiques

- Cadre en aluminium

- Joints en Viton (FKM) ou Perbunan (NBR)

- Vis, écrous et rondelles en acier (zingué)

- Connecteurs en matière synthétique à hautes caractéristiques (FSK)

TSE / TSE-L

- Corps avec sonde de température, rondelle et écrou en acier (zingué)

- Connecteurs en matière synthétique à hautes caractéristiques

- 2.2. CARACTERISTIQUES HYDRAULIQUES

2.2.1 **Pression nominale**
0,5 bar max.

2.2.2 **Fluides hydrauliques**
Huile minérale selon DIN 51524, chap. 1 et 2, émulsions eau-huile, fluides synthétiques tels que les huiles hydrauliques à base d'esters phosphatés.
(Autres sur demande.)

2.2.3 **Température du fluide**
- 20 °C à + 80 °C

2.2.4 **Plage d'affichage du thermomètre FSA / FSK**
Thermomètre T pour FSA:
+ 20 °C à + 80 °C
Thermomètre FT pour FSA / FSK:
0 °C à + 100 °C
- 2.3. CARACTERISTIQUES ELECTRIQUES FSK

2.3.1 **Fonctions électriques**
Type O / Contact ouvrant
Réservoir vide
(Etat à la livraison)

Type O / Contact ouvrant
(connecteur Z4)
Réservoir vide
(Etat à la livraison)

Type O / Contact ouvrant
(connecteur SEW)
Réservoir vide
(Etat à la livraison)

Type C / Contact fermant
Réservoir vide
(Etat à la livraison)

Type W / Inverseur
(connecteur Z4)
Réservoir vide
(Etat à la livraison)

Typ W / Inverseur
(connecteur SEW)
Réservoir vide
(Etat à la livraison)
- 2.3.2 **Puissance de commutation**
8 W max.

2.3.3 **Tension de commutation**
50 V / AC / DC

2.3.4 **Courant de commutation**
0,2 A

2.4. CARACTERISTIQUES ELECTRIQUES TSE / TSE-L

2.4.1 **Fonctions électriques**
Contact ouvrant

2.4.2 **Capacité de commutation**
2,5 A/50 V - 10.000 commutations
0,5 A/50 V - 100.000 commutations

2.4.3 **Courant de commutation min.**
50 mA

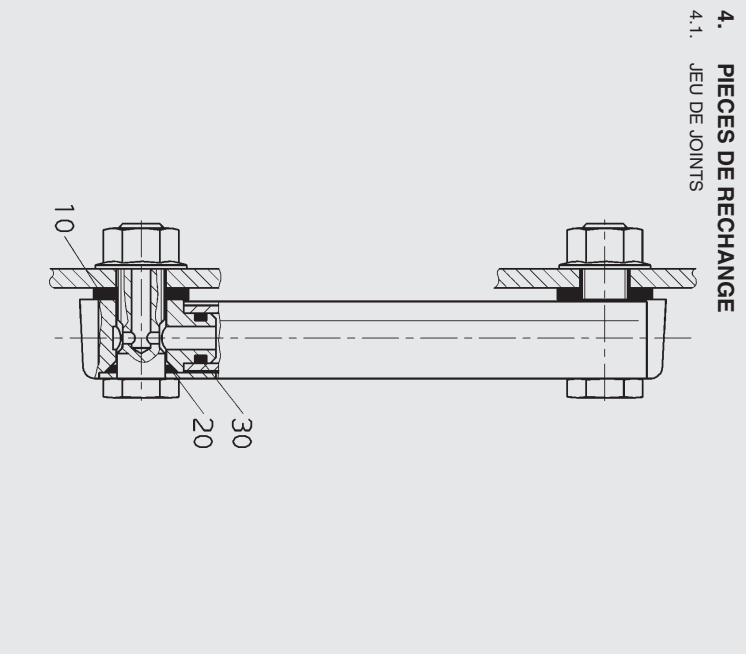
2.4.4 **Tolérance de commutation**
± 5 K

2.4.5 **Hystérésis de commutation**
env. 25 K
3. ENCOMBREMENTS

3.1. INDICATEUR DE NIVEAU FSA FSA standard
-
-
- FSA avec thermocontacteur TSE
-
- FSA / FSK avec sonde thermométrique
-
- Taille nominale
≡ entraxe des vis
- | | L0 | L1 | L2 |
|-----|-----|-----|-----|
| 76 | 107 | 37 | 76 |
| 127 | 158 | 88 | 127 |
| 176 | 207 | 137 | 176 |
| 254 | 285 | 215 | 254 |
| 381 | 412 | 342 | 381 |
- HYDAC
- 6

4. PIÈCES DE RECHANGE

4.1. JEU DE JOINTS



Jeu de joints	Code de commande = code article
FSA - 76 - 381 - 1.X	704 616
FSA - 76 - 381 - 2.X	704 627

5. REMARQUE

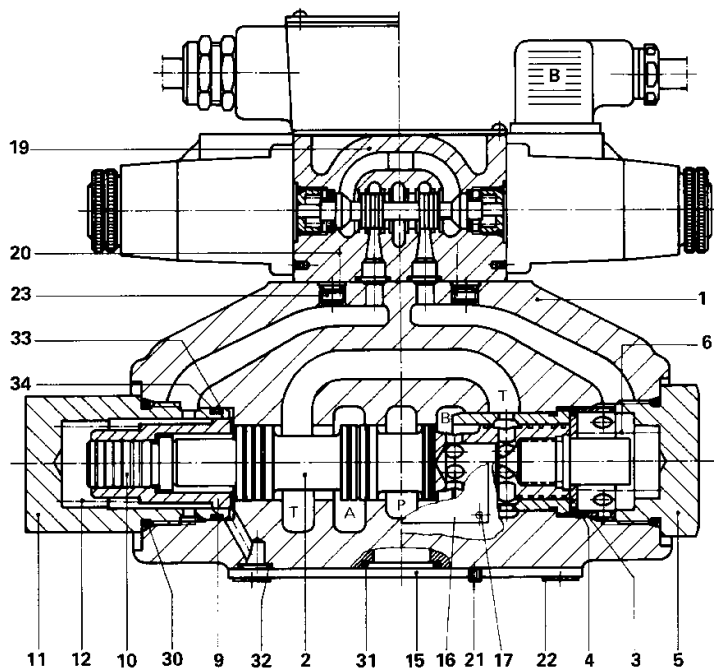
Les données de ce prospectus se réfèrent aux conditions de fonctionnement et d'utilisation décrites. Pour des conditions d'utilisation et de fonctionnement différentes, veuillez vous adresser au service technique compétent. Sous réserve de modifications techniques.

5.21 VALVE D4 1V W

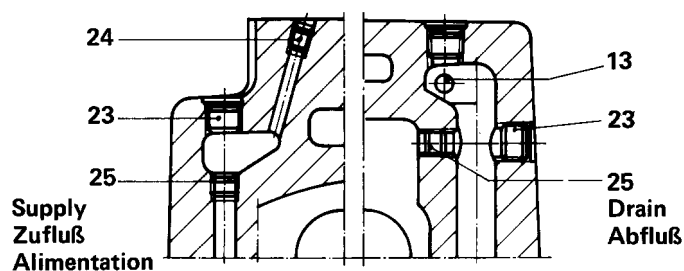
ECL Code : 1-10-729-94

Valve Reference : D 4 1V W 034 C 4 V J W 75

ITEM N°	Description	QTY
1	body	1
2	spool	1
3	stop sleeve	1
4	washer	1
5	end cap	1
6	spring	1
9	sleeve	1
10	piston	1
11	end cap	1
12	spring	1
13	plug	1
15	shipping plate	1
16	nameplate	1
17	chober rivet 2,4 x 4	4
19	pilot valve	1
20	screw	4
21	roll pin	2
22	plug	4
23	plug	5
24	orifice 1,2	1
25	plug	2
30	o-ring viton	2
31	o-ring viton	4
32	o-ring viton	3
33	back-up washer viton	1
34	o-ring viton	1



**Pilot
Steuerung
Pilotage**

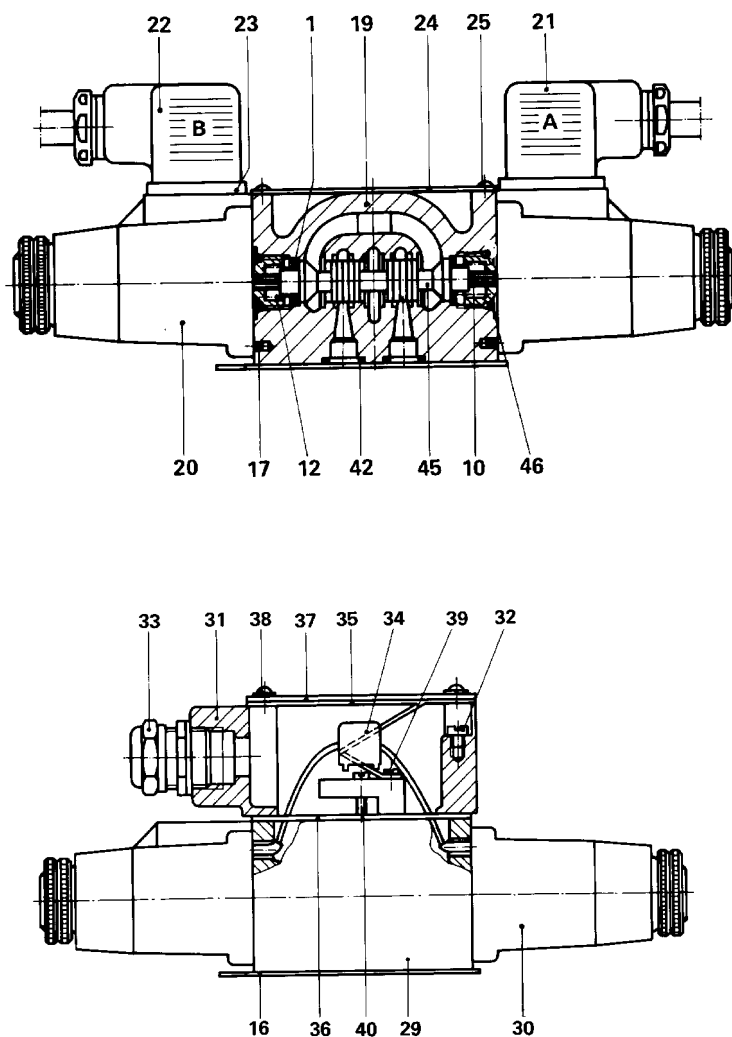


5.22 VALVE D1 VW**1. DIRECTIONAL CONTROL VALVE DOUBLE SOLENOID SPRING CENTERED**

ECL Code : 0-05-325-75

Valve Reference : D 1V W 004 C V J W 75

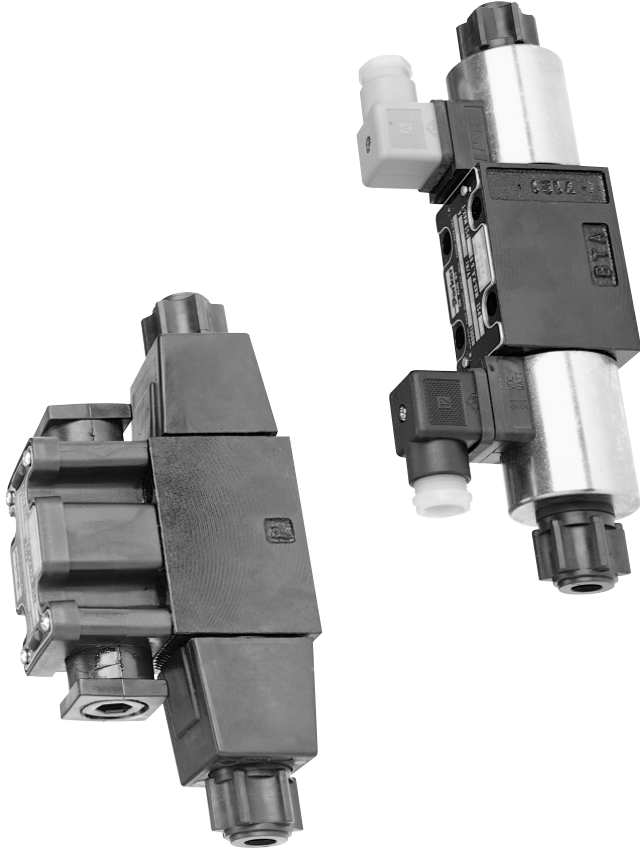
ITEM N°	Description	QTY
1	retainer	2
10	push rod	2
12	spring for spool	2
16	shipping plate	1
17	roll pin	2
19	valve body	1
20	solenoid	2
21	Hirschmann plug, grey A	1
22	Hirschmann plug, grey B	1
23	Hirschmann plug gasket	2
24	name plate	1
25	chabert rivet 2,4 x 4	2
29	body	1
30	solenoid	2
31	conduit	1
32	ground screw	1
33	cable damp	1
34	connector	1
35	gasket	1
36	gasket	1
37	name plate	1
38	captive screw	4
39	screw	1
40	screw	2
42	o-ring viton	4
45	spool	1
46	o-ring	2





Bulletin 2531-M2/USA
Service Bulletin
Series D1VW, C Style

Effective: March 23, 1998



Model Code

Standard Valves	1
Soft Shift Valves	2-3

Parts Data

D1VW*C**C**	4
D1VW*C**P** , D1VW*C**W** , D1VW*C**S**	5
D1VW*C**H**	6
D1VW*C**CS*	7
D1VW*C**PS*	8
D1VW*C**E* (Explosion Proof)	9

Ordering Information

.....	10-11
-------	-------

Spool Chart

.....	12
-------	----

Wiring Instructions

.....	13-14
-------	-------

Coil Data

.....	15
-------	----

Troubleshooting Guide

.....	16-17
-------	-------

⚠ WARNING

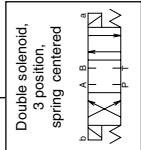
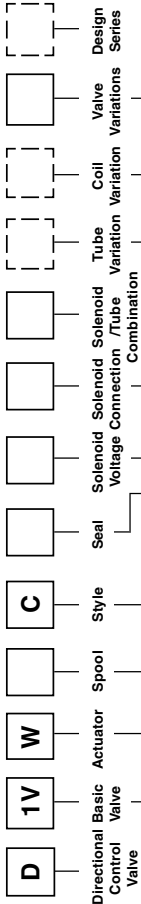
FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.
This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through a written analysis and testing, is solely responsible for making the final selection of the products and systems for their application. The products described herein are not intended for use in applications requiring special design or engineering expertise.
The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

Offer of Sale

The items described in this document are hereby offered for sale by Parker Hannifin Corporation, its subsidiaries or its authorized distributors. This offer and its acceptance are governed by the provisions stated in the "Offer of Sale".

© Copyright 1998, Parker Hannifin Corporation, All Rights Reserved
2531-M2.pme.sm.ii

Standard Valves



Code	Description
N	Nitrile
V	Fluorocarbon
E	EPR

* Tube variations not available on explosion proof.

Code	Description
Omit	Standard Coil
B	Without Coil
C†	Hazardous Location
V†	Surge Suppression

† Conduit solenoid connection only.

* DC only, not available with solenoid connection H.

Code	Description
Omit	Standard Valve
4	C.S.A. Approved
5	Signal Lights
6	Manaplug 5-Pin Without Lights
56	Manaplug with Lights

Code	Description
A #	24/50 VAC
R #	24/60 VAC
Q #	100/50 VAC
Y	120/60 - 110/50 VAC
T	240/60 - 220/50 VAC
L	6 VDC
K	12 VDC
J	24 VDC
D	120 VDC
Z	250 VDC

High Watt Coil only.

Code	Description
C	Conduit Box
E	Explosion Proof
P	Hirschmann w/ Plug
S # †	Dual Spade Lug
W †	Hirschmann w/o Plug
H* † †	Single Spade Lug

† Not available with lights
Not CSA approved
* DC only

Code	Description
11	11
14	14
15	15
16	16
21	21
22	22
81	81
82	82

* 8 spool has closed crossover
** 9 spool has open crossover

Code	Coil	Tube
Omit	High Watt	Low Pressure
H*	High Watt	High Pressure
F	Low Watt	Low Pressure
FH*	Low Watt	High Pressure
D †	Explosion proof CENELEC	
M †	Explosion Proof M.S.H.A.	
U †	Explosion Proof UL/CSA	

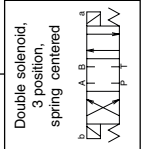
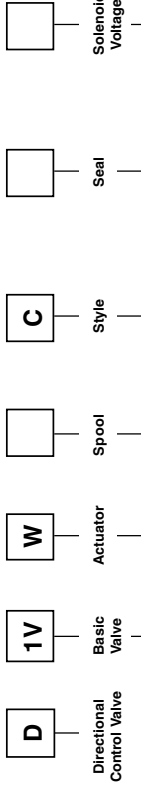
* High pressure tube rating
210 Bar (3000 PSI)

† Explosion proof coils are 60Hz @ standard voltage and are high wattage only. Dual frequency rating not available.

Valve Weight:
Single Solenoid 1.36 kg (3.0 lbs)
Double Solenoid 1.6 kg (3.5 lbs)
Standard Bolt Kit: BK209

2531-M2.pme.sm.ij

Soft Shift Valves



Code	Description
N	Nitrile
V	Fluorocarbon
E	EPR

Code	Symbol	Code	Symbol	Code	Symbol
1		11			
2		14			
3		15			
4		16			
5		21			
6		22			
7		81			
8*, 9**		82			
10					

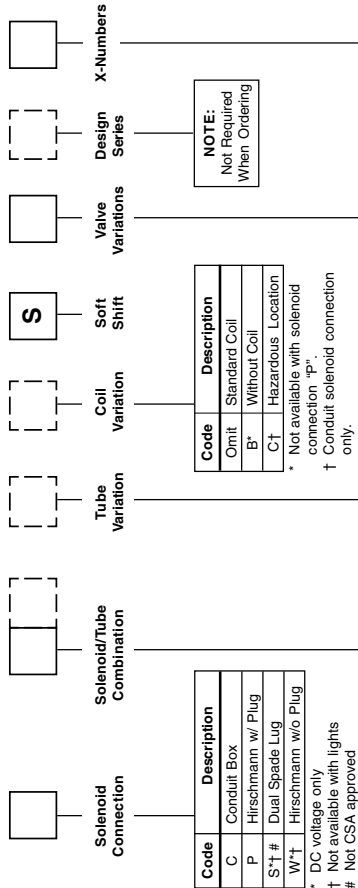
* 8 spool has closed crossover
** 9 spool has open crossover

* AC input voltage, not necessarily coil voltage.

Code	Description
Q *	100/50 VAC
Y *	120/60 - 110/50 VAC
T *	240/60 - 220/50 VAC
L	6 VDC
K	12 VDC
J	24 VDC
D	120 VDC
Z	250 VDC

2531-M2.pme.sm.ij

Soft Shift Valves



Code	Coil	Tube
Omit	High Watt	Low Pressure
H*	High Watt	High Pressure
F†	Low Watt	Low Pressure
FH†	Low Watt	High Pressure

* High pressure tube rating 210 Bar (3000 PSI)
† Not available with AC input.

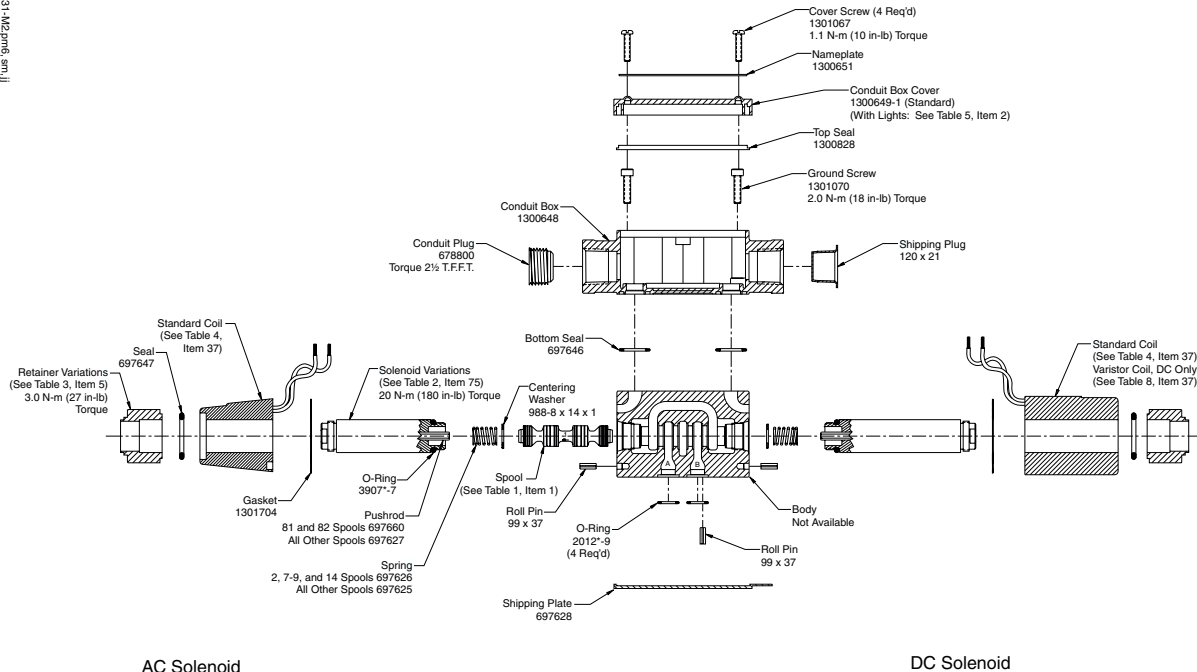
Code	Description
Omit	Standard Tube
R	Repairable Manual Override

X-Number	Orifice Size	Voltage	Spool Center Condition *			
			Closed		Open	
			De-Energize	Energize	De-Energize	Energize
XB072	0.020	AC	175 ms	700 ms	600 ms	800 ms
		DC	200 ms	650 ms	700ms	650 ms
XB073	0.030	AC	150 ms	400 ms	500 ms	600 ms
		DC	125 ms	325 ms	550 ms	550 ms
XB074	0.040	AC	125 ms	300 ms	450 ms	500 ms
		DC	100 ms	250 ms	400 ms	450 ms
XB075	0.050	AC	100 ms	250 ms	400 ms	450 ms
		DC	50 ms	225n ms	400 ms	400 ms
XB070	No Orifice	AC	75 ms	250 ms	300 ms	350 ms
		DC	50 ms	200 ms	300 ms	300 ms

* Step response times were obtained under the following conditions: 100 SSU fluid @ 120°F with the valve operating at nominal pressure and flow. Published response times are nominal and may vary with spool, flow, pressure and temperature.

Orifice Kit:	Part Number 1301661
Orifice Removal Tool:	Part Number 1301651

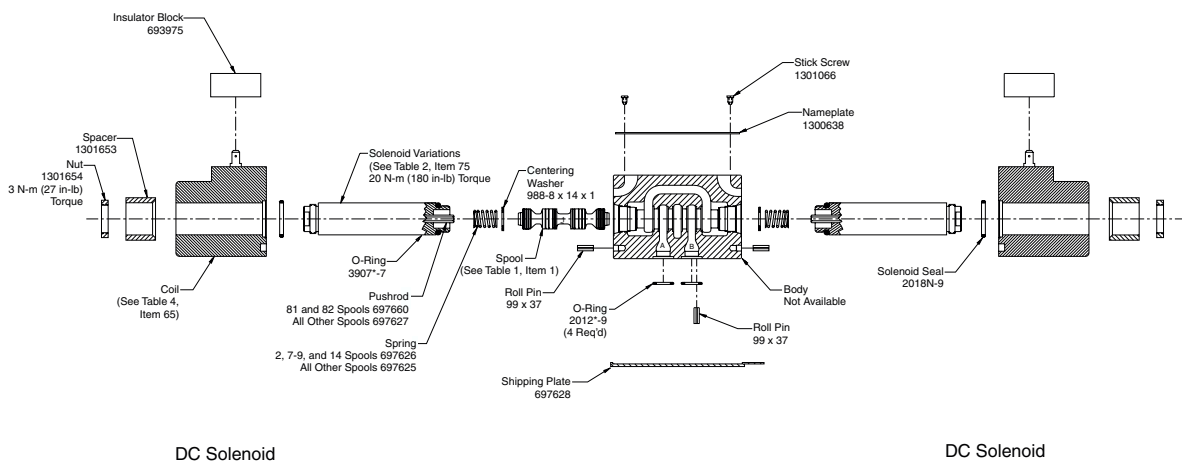
NOTES:
1) AC Solenoid Components shown on left side, DC Components shown on right side.
2) * Indicates Seal Compound: N-Nitrile, V-Fluorocarbon, E-EPR.



AC Solenoid

DC Solenoid

Double A.C. Solenoid Model
Double D.C. Solenoid Model

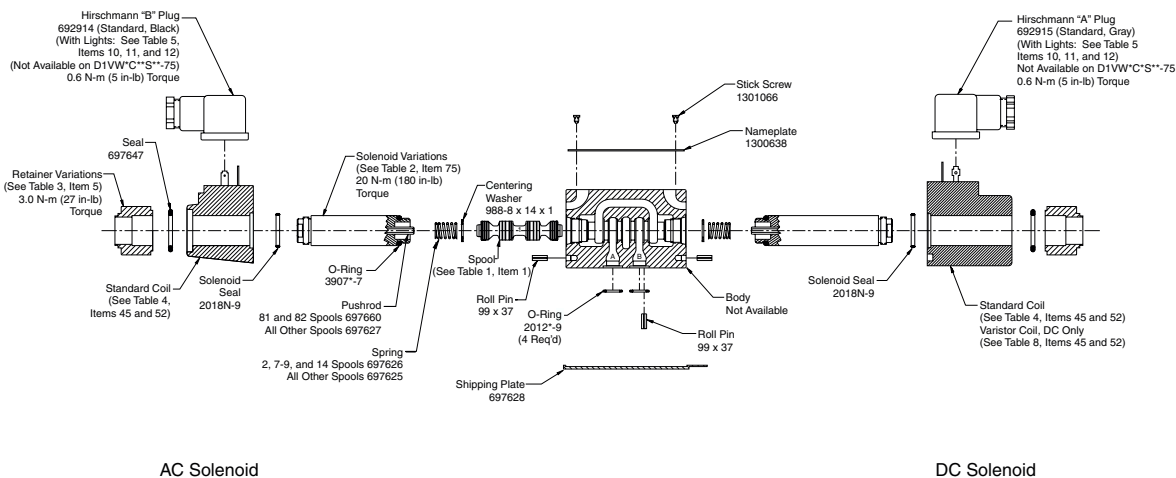


DC Solenoid

DC Solenoid

Double D.C. Solenoid Model

NOTES:
1) * Indicates Seal Compound. N-Nitrile, V-Fluorocarbon, E-EPR.

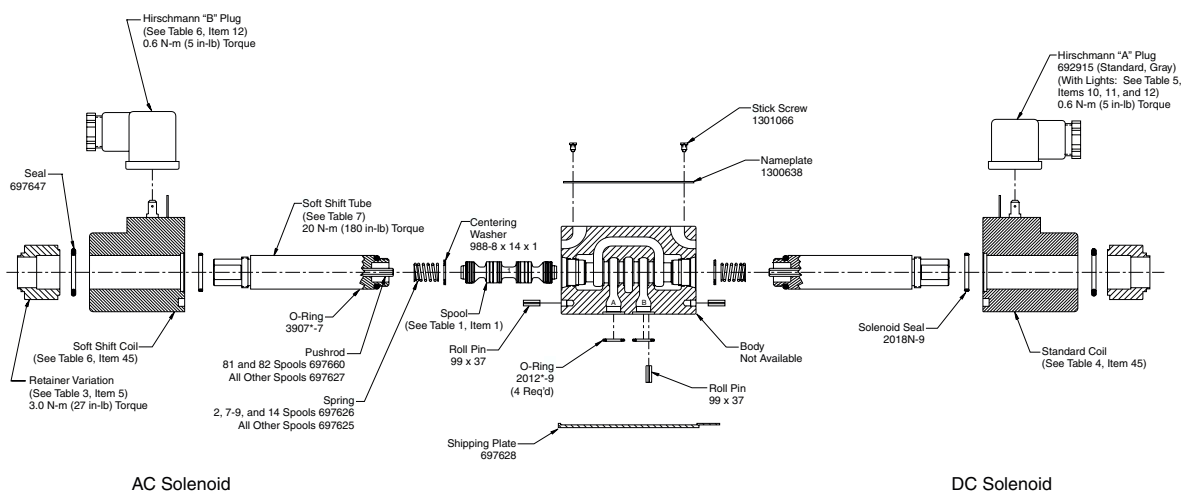


AC Solenoid

DC Solenoid

Double A.C. Solenoid Model
Double D.C. Solenoid Model

NOTES:
1) AC Solenoid Components shown on left side, DC Components shown on right side.
2) * Indicates Seal Compound. N-Nitrile, V-Fluorocarbon, E-EPR.

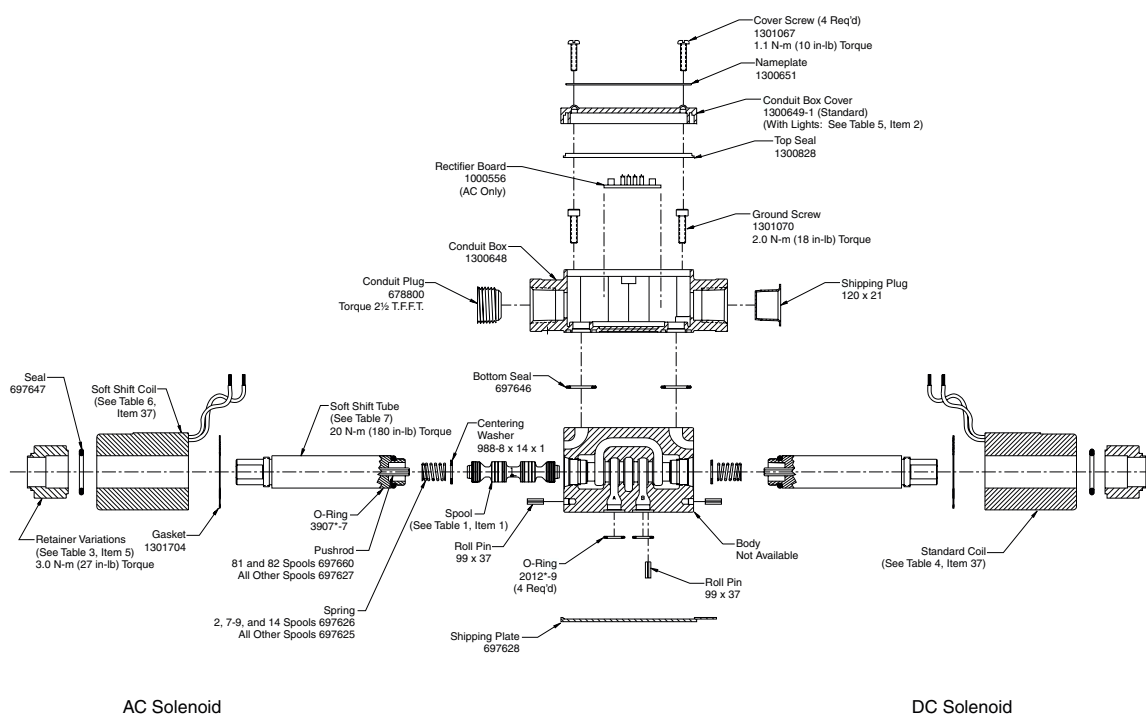


AC Solenoid

DC Solenoid

Double A.C. Solenoid Model
Double D.C. Solenoid Model

NOTES:
1) AC Solenoid Components shown on left side, DC Components shown on right side.
2) * Indicates Seal Compound. N-Nitrile, V-Fluorocarbon, E-EPR.



AC Solenoid

DC Solenoid

Double A.C. Solenoid Model
Double D.C. Solenoid Model

NOTES:
1) AC Solenoid Components shown on left side, DC Components shown on right side.
2) * Indicates Seal Compound. N-Nitrile, V-Fluorocarbon, E-EPR.

2531-M2/USA

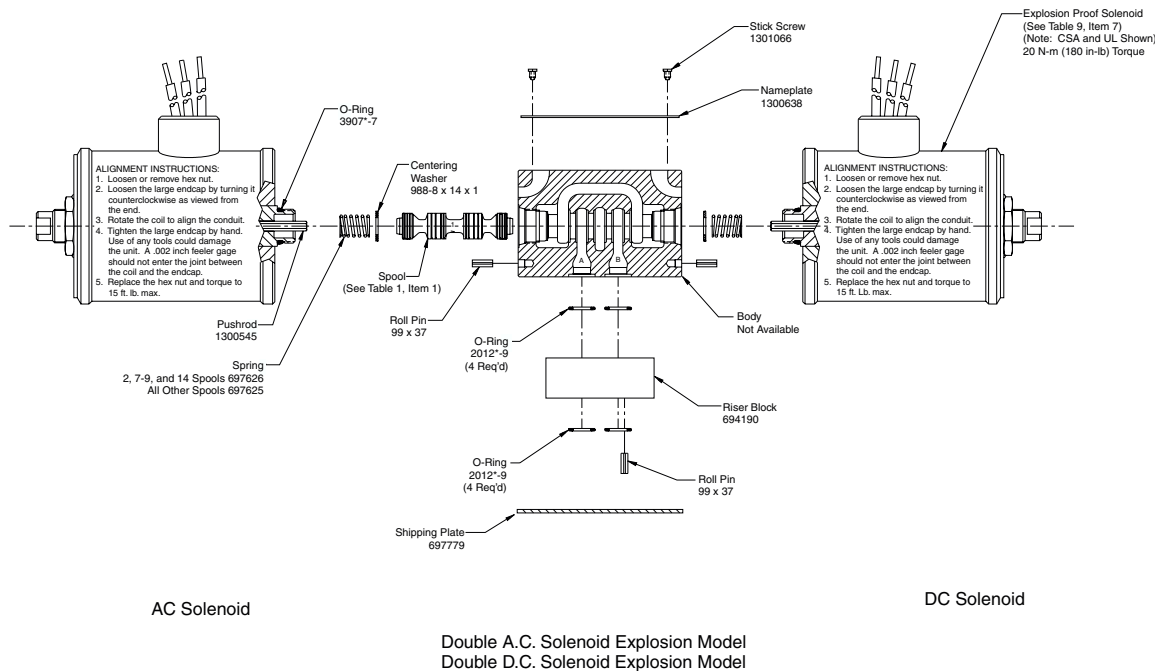


Table 1 - Spools

Code	Item	Part Number	Qty	Description
1	1	697601	1	#1 Spool
2	1	697602	1	#2 Spool
3	1	697603	1	#3 Spool
4	1	697604	1	#4 Spool
5	1	697605	1	#5 Spool
6	1	697606	1	#6 Spool
7	1	697607	1	#7 Spool
8	1	697608	1	#8 Spool
9	1	1302128	1	#9 Spool
10	1	697610	1	#10 Spool
11	1	697611	1	#11 Spool
14	1	697607	1	#7 Spool Reversed
15	1	697603	1	#3 Spool Reversed
16	1	697605	1	#5 Spool Reversed
21	1	697621	1	#21 Spool
22	1	697621	1	#21 Spool Reversed
81	1	1210011	1	#1 20% Overlap Spool
82	1	1210012	1	#11 20% Bleed Spool

△

Table 3 - Retainer Variation

Code	Item	Part Number	Qty	Description
AI except R, S, P & T	5	697981	A/R	Standard Retainer
P or FP	5	697833	A/R	Extended Override Retainer
HP or FHP	5	697161	A/R	Extended Override Boot
AI R	5	697981	A/R	Reparable Override Retainer
AI S	5	1300289	A/R	Standard Retainer
	5	1300812	A/R	Tamperproof Disc
AI T	5	1300532	A/R	Tamperproof Disc

△ Arrow points toward 'A' port for all spools except: 14, 15, 16 & 22.

△ Replicable cartridge P/N 1300300, for o-ring only, PN 5-190-884-75, *** indicates seal compound.

△ N-Nitrile, V-Fluorocarbon, E-EPR.

△ 81 and 82 spools not applicable with explosion proof options

Table 2 - Solenoid Variations

Code	Item	Part Number	Qty	Description
Onlit or F	75	697632	A/R	A.C. Tube 1500 PSI
	75	697633	A/R	D.C. Tube 150PSI
H or FH	75	697714	A/R	A.C. Tube 3000 PSI
	75	697717	A/R	D.C. Tube 3000 PSI
P or FP	75	697715	A/R	Extended A.C. Tube 1500 PSI
	75	697718	A/R	Extended D.C. Tube 1500 PSI
HP or FHP	75	697716	A/R	Extended A.C. Tube 3000 PSI
	75	697719	A/R	Extended D.C. Tube 3000 PSI
R or FR	75	1300296	A/R	Reparable A.C. Tube 1500 PSI
	75	1300297	A/R	Reparable A.C. Tube 1500 PSI
HR or FHR	75	1860017	A/R	Reparable A.C. Tube 3000 PSI
	75	N/A	A/R	Reparable D.C. Tube 3000 PSI

△

Table 5 - Signal Lights

Code	Item	Part Number	Qty	Description
AI	10	697047	A/R	Label - 'A' Solenoid
	11	697048	A/R	Label - 'B' Solenoid
YP*5	12	694936	A/R	Plug with light, 100-120V
QP*5	12	694936	A/R	Plug with light, 100-120V
QPD*5	12	694936	A/R	Plug with light, 100-120V
TP*5	12	694936	A/R	Plug with light, 240V
KP*5	12	694936	A/R	Plug with light, 12V
JP*5	12	694936	A/R	Plug with light, 24V
DP*5	12	694936	A/R	Plug with light, 100-120V
YC*5	2	1300650-Y	1	Conduit Box Cover, 120VAC
QC*5	2	1300650-Q	1	Conduit Box Cover, 100VAC
TC*5	2	1300650-T	1	Conduit Box Cover, 240VAC
RC*5	2	1300650-R	1	Conduit Box Cover, 24VAC
AC*5	2	1300650-A	1	Conduit Box Cover, 24VAC
LC*5	2	1300650-L	1	Conduit Box Cover, 6VDC
KC*5	2	1300650-K	1	Conduit Box Cover, 12VDC
JC*5	2	1300650-J	1	Conduit Box Cover, 24VDC
DC*5	2	1300650-D	1	Conduit Box Cover, 120VDC
ZC*5	2	1300650-Z	1	Conduit Box Cover, 250VDC

Table 7 - Soft Shift Tubes, AC or DC

Code	Item	Part Number	Qty	Description
S	75	1860024*	A/R	1500 PSI Soft Shift Tube
SH	75	1860025*	A/R	3000 PSI Soft Shift Tube
SR	75	1301656*	A/R	1500 PSI Replicable Soft Shift Tube
SHR	75	1301656*	A/R	3000 PSI Replicable Soft Shift Tube

* Indicates size of office. The dash number specifies the following:

- 0 = 0.000 inch X - Number X8070
- 2 = 0.000 inch X - Number X8072
- 3 = 0.000 inch X - Number X8073
- 4 = 0.000 inch X - Number X8074
- 5 = 0.050 inch X - Number X8075

Table 4 - Standard Coils

Code	Description	Sol Connection Item		C (Conduit) 37	P (Hirsch w/ Plug) 45	S (Dual Spade) 52	W (Hirsch w/o Plug) 45	H (Spade w/o Variator) 65
		Qty	Part Number					
Y*	120/60-110/50 VAC	A/R	697212	1301819	697228	N/A	N/A	N/A
Y*	120/60-110/50 VAC Low Watt	A/R	692619	1301817	693715	N/A	N/A	N/A
T*	240/60-220/50 VAC	A/R	697213	1301820	697229	N/A	N/A	N/A
T*	240/60-220/50 VAC	A/R	1301930	1301818	1301932	N/A	N/A	N/A
Q*	100/60 VAC	A/R	697348	N/A	697350	N/A	N/A	N/A
Q*	100/60 VAC Low Watt	A/R	N/A	N/A	N/A	N/A	N/A	N/A
Q*	100/60-100/50 VAC	A/R	697863	1300348	697863	N/A	N/A	N/A
R*	24/50 VAC	A/R	1300344	N/A	1300348	N/A	N/A	N/A
R*	24/50 VAC	A/R	1300715	N/A	N/A	N/A	N/A	N/A
A*	24/50 VAC	A/R	1300345	1300349	1300349	N/A	N/A	N/A
A*	24/50 VAC Low Watt	A/R	N/A	N/A	N/A	N/A	N/A	N/A
E*	24/50-24/60 VDC	A/R	697214	697693	697693	N/A	N/A	N/A
L*	6 VDC Low Watt	A/R	1301620	1301515	1301610	1301515	1301620	1301625
L*	6 VDC Low Watt	A/R	1301530	1301525	1301615	1301525	1301625	1301625
K*	12 VDC	A/R	1301521	1301516	1301611	1301516	1301621	1301626
K*	12 VDC Low Watt	A/R	1301531	1301526	1301616	1301526	1301626	1301626
J*	24 VDC	A/R	1301522	1301517	1301612	1301517	1301622	1301622
J*	24 VDC Low Watt	A/R	1301532	1301527	1301617	1301527	1301627	1301627
D*	120 VDC	A/R	1301523	1301518	1301613	1301518	1301623	1301623
D*	120 VDC Low Watt	A/R	1301533	1301528	1301618	1301528	1301628	1301628
Z*	250 VDC	A/R	1301524	1301519	1301614	1301519	1301624	1301624
Z*	250 VDC Low Watt	A/R	1301534	1300529	1301619	1300529	1301629	1301629

Table 6 - Soft Shift Coils, AC

Code	Description	Sol Connection Item		C (Conduit) 37	P (Hirsch w/ Plug) 45	S (Dual Spade) 52	W (Hirsch w/o Plug) 45	H (Spade w/o Variator) 65
		Qty	Part Number					
Y*	120/60-110/50 VAC	A/R	1301682	1301692	1301692	N/A	N/A	N/A
Y*	120/60-110/50 VAC Low Watt	A/R	1301682	1301692	1301692	N/A	N/A	N/A
T*	240/60-220/50 VAC	A/R	1301683	1301693	1301693	N/A	N/A	N/A
T*	240/60-220/50 VAC Low Watt	A/R	1301683	1301693	1301693	N/A	N/A	N/A
Q*	100/60-110/50 VAC	A/R	1301694	1301694	1301694	N/A	N/A	N/A

Table 8 - Variator Coils, DC Only

Code	Description	Sol Connection Item		C (Conduit) 37	P (Hirsch w/ Plugs) 45	S (Dual Spade) 52	W (Hirsch w/o Plug) 45
		Qty	Part Number				
L*	6 VDC	A/R	1860001-L	1860003-L	1860005-L	1860003-L	1860003-L
L*	6 VDC Low Watt	A/R	1860002-L	1860004-L	1860006-L	1860004-L	1860004-L
K*	12 VDC	A/R	1860001-K	1860003-K	1860005-K	1860003-K	1860003-K
K*	12 VDC Low Watt	A/R	1860002-K	1860004-K	1860006-K	1860004-K	1860004-K
J*	24 VDC	A/R	1860001-J	1860003-J	1860005-J	1860003-J	1860003-J
J*	24 VDC Low Watt	A/R	1860002-J	1860004-J	1860006-J	1860004-J	1860004-J
D*	120 VDC	A/R	1860001-D	1860003-D	1860005-D	1860003-D	1860003-D
D*	120 VDC Low Watt	A/R	1860002-D	1860004-D	1860006-D	1860004-D	1860004-D
Z*	250 VDC	A/R	1860001-Z	1860003-Z	1860005-Z	1860003-Z	1860003-Z
Z*	250 VDC Low Watt	A/R	1860002-Z	1860004-Z	1860006-Z	1860004-Z	1860004-Z


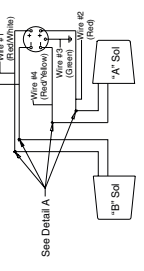

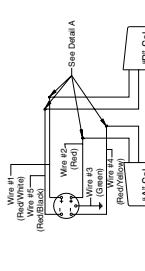
Table 9 - Explosion Proof Coils

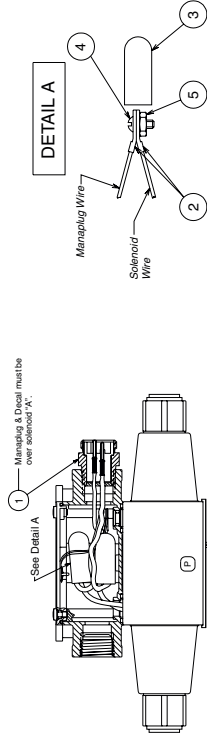
Code	Description	Sol Connection Item		D (Cepalec) 37	M (MSHA) 45	U (UL & CSA) 52
		Qty	Part Number			
YE	120/60-110/50 VAC	A/R	1300850	697761	697770	697770
YE	240/60-220/50 VAC	A/R	1300853	697762	697771	697771
QE	100/60 VAC	A/R	1300856	697763	697772	697772
RE	24/60 VAC	A/R	1300857	697764	697773	697773
AE	24/50 VAC	A/R	1300858	N/A	N/A	N/A
LE	6 VDC	A/R	1300858	697765	697774	697774
KE	12 VDC	A/R	1300859	697766	697775	697775
JE	24 VDC	A/R	1300860	697767	697776	697776
DE	120 VDC	A/R	1300861	697768	697777	697777
ZE	250 VDC	A/R	1300862	697769	697778	697778
NE	220/50	A/R	1300854	N/A	1300714	1300714
PE	110/50	A/R	1300855	N/A	1300332	1300332

B-SOLENOID * (A-SOLENOID)	A-SOLENOID * (B-SOLENOID)	B-SOLENOID * (A-SOLENOID)	A-SOLENOID * (B-SOLENOID)

2531-M2.pme.sm.ij

Figure 1: Variation 6, Double Solenoid Models with 5-Pin Manplug without Lights.


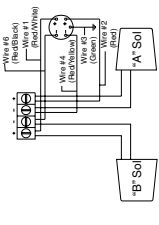

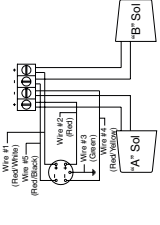
Valve	Spool	Pilot Nameplate Wiring	Wiring diagram	Item	Part Number	Qty	Description
D1VW	All Except 8&9			1	1302154	1	Manplug, 5-Pin
				2	MA693015	8	Ring Terminal
				3	MA6934542	4	Plastic Boot
				4	4 x 277SZ	4	Screw
				5	16 x 104SZ	4	Hex Nut
				6	MA697629	1	Warning Label
D1VW	8&9 Spools only			1	1302154	1	Manplug, 5-Pin
				2	MA693015	8	Ring Terminal
				3	MA6934542	4	Plastic Boot
				4	4 x 277SZ	4	Screw
				5	16 x 104SZ	4	Hex Nut
				6	MA697629	1	Warning Label

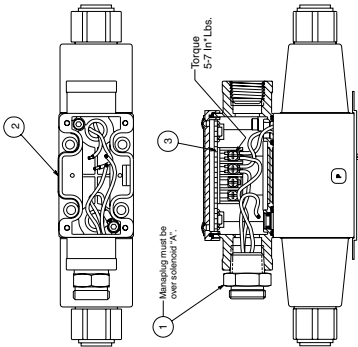


Wiring Instructions:

1. Cut solenoid wires to 100mm (4.00 in.), strip 10mm (.40 in.), and assemble ring terminals (Item 3) to wire.
2. Assemble ring terminals (Item 2) to manplug wires.
3. Slip ground screw (A1301070, Red) through ring terminal on green ground wire (from manplug) and secure to valve body.
4. Following the Wiring Diagram, stack one solenoid wire with one manplug wire & install screw through ring terminals & secure assembly with nut. Cover with plastic boot. (See Detail A)
5. Place warning label (Item 6) on conduit box side.

Figure 2: Variation 56, Double Solenoid Models with 5-Pin Manplug with Lights.

Valve	Spool	Pilot Nameplate Wiring	Wiring diagram	Sol Code	Item	Part Number	Qty	Description
D1VW	All Except 8&9			All	1	1302154	1	Manplug, 5-Pin
				All	2	MA697629	1	Warning Label
				Y		C)1300650-Y	1	Circuit Board - 120VAC
				Q		C)1300650-Q	1	Circuit Board - 100VAC
				T		C)1300650-T	1	Circuit Board - 240VAC
				R		C)1300650-R	1	Circuit Board - 24VAC
D1VW	8&9 Spools Only			A	3	C)1300650-R	1	Circuit Board - 24VAC
				L		C)1300650-L	1	Circuit Board - 6VDC
				K		C)1300650-K	1	Circuit Board - 12VDC
				J		C)1300650-J	1	Circuit Board - 24VDC
				D		C)1300650-D	1	Circuit Board - 120VDC
				Z		C)1300650-Z	1	Circuit Board - 250VDC



NOTES:

- 1) When using the D1 Valve as a pilot, wiring may vary, consult factory.

Solenoid Ratings**

Insulation	Class F
Allowable Deviation from rated voltage	-10% to +15%
Armature	Wet pin type
CSA file LR60407	

** DC Solenoids available with optional molded metal oxide varistor (MOV) for surge suppression.
Leadwire length 6' from coil face.

D1VW Solenoid Electrical Characteristics†

Solenoid Code	Nominal Volts/Hz	In Rush Amps	Holding Amps	Watts
Y	120/60	2.00	0.49	25
	110/50	2.10	0.58	27
T	240/60	1.00	0.26	25
	220/50	1.05	0.31	27
Q	100/50	2.05	24	24
R	24/60	10.50	2.70	27
A	24/50	8.7	2.65	28
L	6 VDC	—	5.00	30
K	12 VDC	—	2.50	30
J	24 VDC	—	1.25	30
D	120 VDC	—	0.25	30
Z	250 VDC	—	0.12	30

D1VW****F Solenoid Electrical Characteristics†

Solenoid Code	Nominal Volts/Hz	In Rush Amps	Holding Amps	Watts
YF	120/60	1.90	0.42	21
	110/50	2.00	0.50	23
TF	240/60	0.95	0.22	21
	220/50	1.00	0.26	23
LF	6 VDC	—	4.00	24
KF	12 VDC	—	2.00	24
JF	24 VDC	—	1.00	24
DF	120 VDC	—	0.20	24
ZF	250 VDC	—	0.10	24

† Based on nominal voltage @ 22°C (72°F)

D1VW Soft Shift AC Electrical Characteristics

Solenoid Code	Input Volts/Hz	Coil Voltage	Holding Amps	Watts
Q	100/50	86 VDC	2.87	30
	120/60	98 VDC	3.27	30
Y	110/50			
T	240/60	214 VDC	7.13	30
	220/50			

Explosion Proof Solenoids

Explosion Proof Solenoid Ratings

U.L. (EU)	Class I, Div. 1 & 2, Groups C & D Class II, Div 1 & 2, Groups E, F & G As defined by the N.E.C
M.S.H.A. (EM)	Complies with 30 CFR, Part 18.
CENELEC (ED)	Complies with BASEEFA requirements for BS5501: Parts 1 and 5 Ex'd CENELEC EN50 – D18, Group II B
CSA Hazardous L	Class II, Groups E, F & G

*Dual frequency not available on explosion proof coils.

Electrical Characteristics* ED, EM and EU

Solenoid Code	Nominal Volts/Hz	In Rush Amps	Holding Amps	Watts
Q	100/60	2.60	0.70	27
Y	120/60	2.20	0.58	27
T	240/60	1.10	0.29	27
R	24/60	11.10	2.90	27
L	6 VDC	—	5.50	33
K	12 VDC	—	2.75	33
J	24 VDC	—	1.38	33
D	120 VDC	—	0.28	33
Z	250 VDC	—	0.13	33

Troubleshooting Guide

Warning

Before any circuit connection is broken, be sure to turn off all power and relieve system pressure. Lower all vertical loads and cylinders, lock any load which could produce pressure and discharge any accumulators. Plug and cap all lines and openings to prevent contamination from entering the system.

Cleaning and Inspection

1. Proper cleaning is a critical part of preventive maintenance in the use of directional control valves. All parts should be cleaned with a solvent that is compatible with the system fluid. Compressed air may also work well when cleaning orifices and passage ways, but proper filtration must be employed to remove water and contamination.

NOTE: Always make sure all parts have been cleaned before reassembling.

2. Inspection

- a. Inspect all passage ways for obstructions.
 - b. Inspect all washers, push pins, plungers and pole faces for signs of wear and/or mushrooming. Inspect all springs for signs of distortion. Replace parts as necessary.
 - c. Look for nicks and burrs on the spool and bore lands. Nicks in these areas indicate likely contamination of the system fluid.
3. If there are no signs of nicks or burrs on the spool and bore, check the spool clearance as follows:
 - a. Lubricate the spool and bore with clean system fluid.
 - b. Insert the spool back into the body and slowly move the spool back and forth. The spool should move freely. If there is any sticking between the spool and the bore, remove the spool and repeat 2b.
 - c. The spool clearance can also be checked by placing the valve body on end and inserting the spool. Gravity will pull the spool to the other end if there is no sticking.
 - d. After several attempts have been made without resolution, replace the valve.

Troubleshooting

Problem: Valve spool fails to move

	Cause	Recommendation
Mechanical	Recommended flow exceeded	Check maximum flow rate for appropriate spool by spool function.
	Recommended pressure exceeded	Check maximum pressure rating for valve.
	Improper installation connections	Check installation drawings.
	Contamination in system	Disassemble, inspect, clean and flush.
	Improper assembly	Check proper assembly. Refer to drawing for appropriate model.
Electrical	Valve has silted	Disassemble and clean valve.
	Power off	Turn power on.
	Improper voltage	Check voltage requirements for valve model.
	Faulty connection	Check connections.
	Faulty coil	Check coil resistance.

Troubleshooting Guide

Problem: Valve produces undesirable response

	Cause	Recommendation
Mechanical	Recommended flow exceeded	Check maximum flow rate for appropriate spool by spool function.
	Recommended pressure exceeded	Check maximum pressure rating for valve.
	Improper installation connections	Check installation drawings.
	Contamination in system	Disassemble, inspect, clean and flush.
	Improper assembly	Check proper assembly. Refer to drawing for appropriate model.
	Improper fluid	Check fluid recommendations.
Electrical	Recommended temperature exceeded (indicated by fluid discoloration or spool tarnishing)	Check maximum temperature recommendations.
	Incorrect orifice size (soft shift only)	Check orifice size for desired response time.
	Improper voltage	Check voltage requirements for valve model.
	Faulty connection	Check connections.
	Faulty coil	Check coil resistance.

5.23 PRESSURE RELIEF VALVE ZDV

Location	ECL code	Reference
Hydraulic Diagram / Extr. & Tight.	1-10-731-82	ZDV-AB01-5-SO-D5



Characteristics

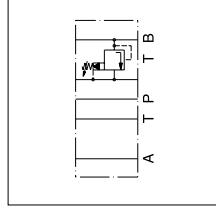
Pilot operated pressure relief valves series ZDV are designed for maximum flow rates.

The relief function can be located between P and T, A and T, B and T or A and T for typical pressure relief functions.

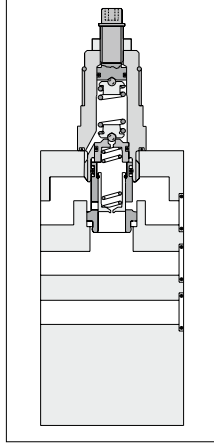
For a pre-charge function the ZDV can be ordered with pressure function between A and B + B and A.



ZDV-P01



ZDV-B02



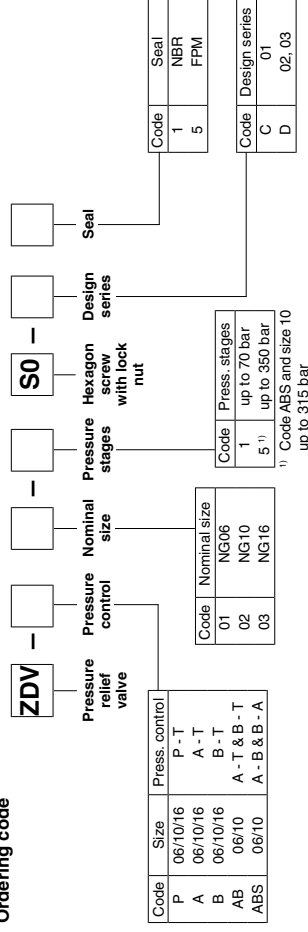
ZDV-B02

Features

- High flow capacity
- Pressure function in P, A, B or A + B
- Sizes
 - ZDV01 - NG06 / CETOP3
 - ZDV02 - NG10 / CETOP5
 - ZDV03 - NG16 / CETOP7

Technical data

General		06	10	16
Size				
Mounting interface		DIN 24340 A6 ISO 4401 NFFPA D03	DIN 24340 A10 ISO 4401 NFFPA D05	DIN 24340 A16 ISO 4401 NFFPA D08
Mounting position		CETOP RP 121		
Ambient temperature	[°C]	unrestricted		
Weight	[kg]	-20...+50		
1 cartridge	[kg]	1.6	3.0	8.45
2 cartridges	[kg]	2.5	3.7	5.7
Hydraulic				
Max. operating pressure	[bar]	up to 350 (ZDY*ABS and size 10 up to 315)		
Nominal flow	[l/min]	80	140	300
Fluid		Hydraulic oil as per DIN 51524...525		
Fluid temperature	[°C]	-20...+80		
Viscosity permitted	[cSt]/[mm²/s]	10...650		
Viscosity recommended	[cSt]/[mm²/s]	30		
Filtration		ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)		

Ordering code

Ordering code details see end of chapter.

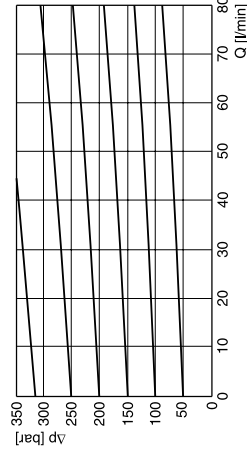
ZDV UK, INDD RH 10.03.08

Characteristic Curves

Pressure Relief Valve Series ZDV (Denison)

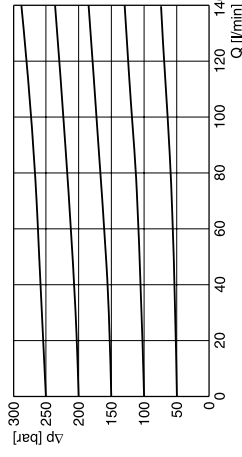
p/Q performance curves

ZDV-P/A/B/ABS01



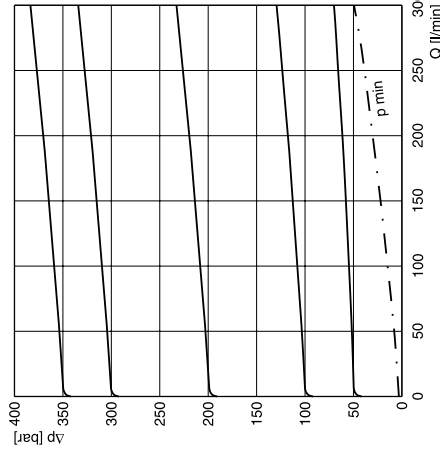
ZDV-AB01

ZDV-P/A/B/AB02



ZDV-ABS02

ZDV-P03-5



Fluid viscosity 30 cSt at 50°C

Ordering Code Details

Pressure Relief Valve
Series ZDV (Denison)

Notes

ZDV01

Pressure control P-T



Series
ZDV-P01-1-S0-D1
ZDV-P01-5-S0-D1

Order No.
098-91203-0
098-91202-0

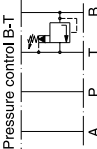
Pressure control A-T



Series
ZDV-A01-1-S0-D1
ZDV-A01-5-S0-D1

Order No.
098-91203-0
098-91204-0

Pressure control B-T



Series
ZDV-B01-1-S0-D1
ZDV-B01-5-S0-D1

Order No.
098-91205-0
098-91206-0

1 = 7 ... 70 bar
5 = 7 ... 350 bar

ZDV02

Pressure control P-T



Series
ZDV-P02-1-S0-D1
ZDV-P02-5-S0-D1

Order No.
098-91034-0
098-91035-0

Pressure control A-T



Series
ZDV-A02-1-S0-D1
ZDV-A02-5-S0-D1

Order No.
098-91036-0
098-91037-0

Pressure control B-T



Series
ZDV-B02-1-S0-D1
ZDV-B02-5-S0-D1

Order No.
098-91038-0
098-91039-0

ZDV03

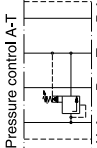
Pressure control P-T



Series
ZDV-P03-1-S0-C1
ZDV-P03-5-S0-C1

Order No.
098-91432-0
098-91418-0

Pressure control A-T



Series
ZDV-A03-1-S0-C1
ZDV-A03-5-S0-C1

Order No.
098-91415-0
098-91416-0

Pressure control B-T



Series
ZDV-B03-1-S0-C1
ZDV-B03-5-S0-C1

Order No.
098-91431-0
098-91417-0

5.24 HYDRAULIC MOTOR TYPE OMR

Location	ECL code	Reference
Hydraulic Diagram / Tightening mechanism	0-05-346-59	OMR 315 – 151 – 0717



Hydraulic motors OMR, OMR C, and OMRW N series 5 and 6 Metric versions

Spare parts list / service manual

HN.12.O8.52 replaces HN.12.O7.52



Index

Cost-free repairs	Page
Service shops	2
Exploded view: OMR Series 6 with separate spigot flange	3
Exploded view: OMR and OMR C Series 5 and 6 with separate spigot flange ..	4
Exploded view: OMRW N series 5	5
Spare parts list	6
Tightening torque	9
Dismantling	10
Assembly	14

Vilger opmærksom på at den vederlagsfri reparation som er omtalt i Danfoss Almindelige Leveringsbetingelser kun udføres hos Danfoss Nordborg eller hos Danfoss autoriserede service shops (side 2).

We would point out that cost-free repairs as mentioned in Danfoss General Conditions of Sale, are carried out only at Danfoss Nordborg or at service shops authorized by Danfoss (page 2).

Wir machen darauf aufmerksam, dass die in den "Allgemeinen Lieferbedingungen" von Danfoss erwähnte kostenlose Reparatur nur bei Danfoss Nordborg oder bei den von Danfoss autorisierten Kundendienstwerkstätten ausgeführt wird (Seite 2).

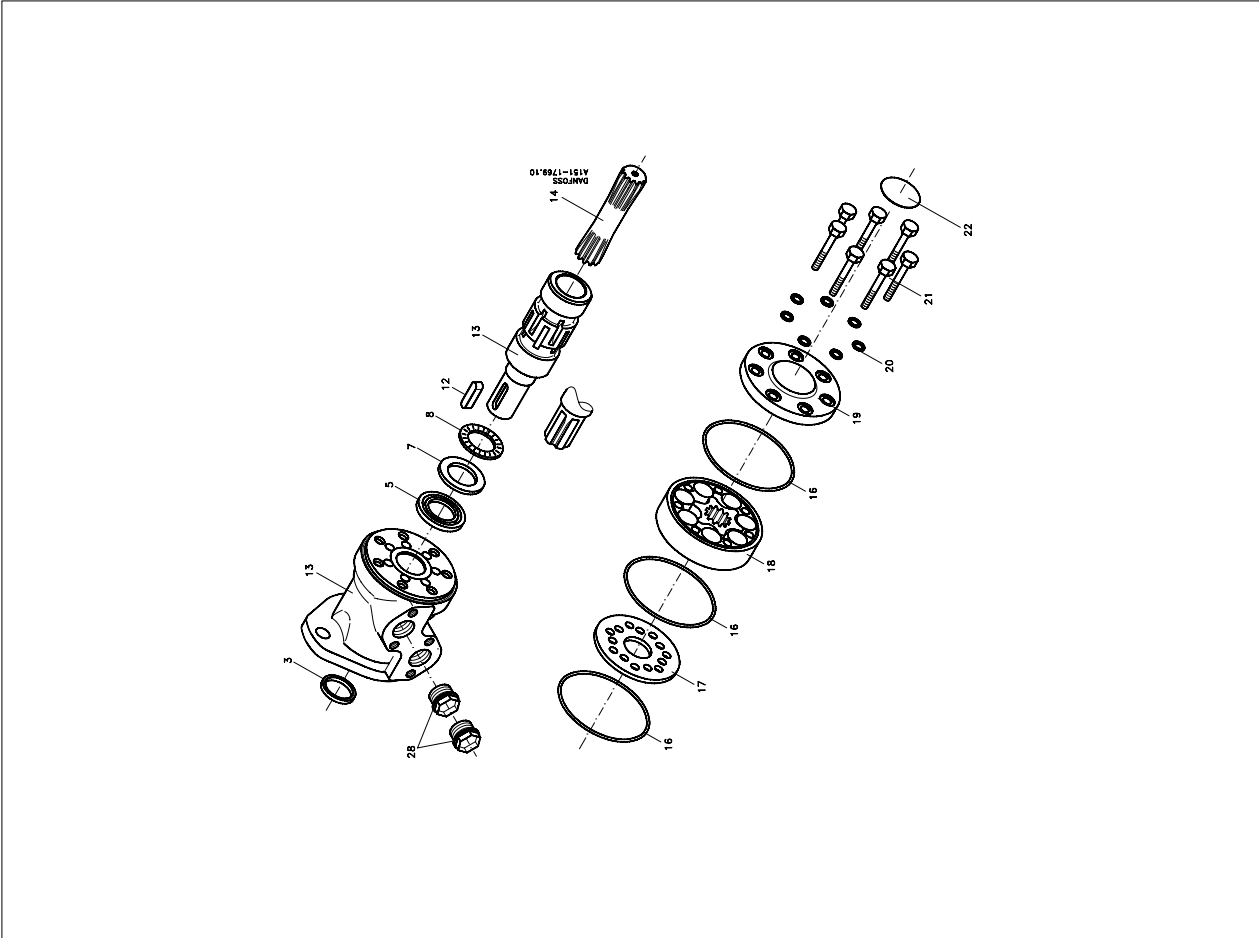
Nous faisons observer que la réparation gratuite mentionnée dans les Conditions générales de Vente de Danfoss ne devra être effectuée que dans les ateliers Danfoss à Nordborg ou dans les ateliers de dépannage agréés par Danfoss (page 2).

Authorized Service Shops

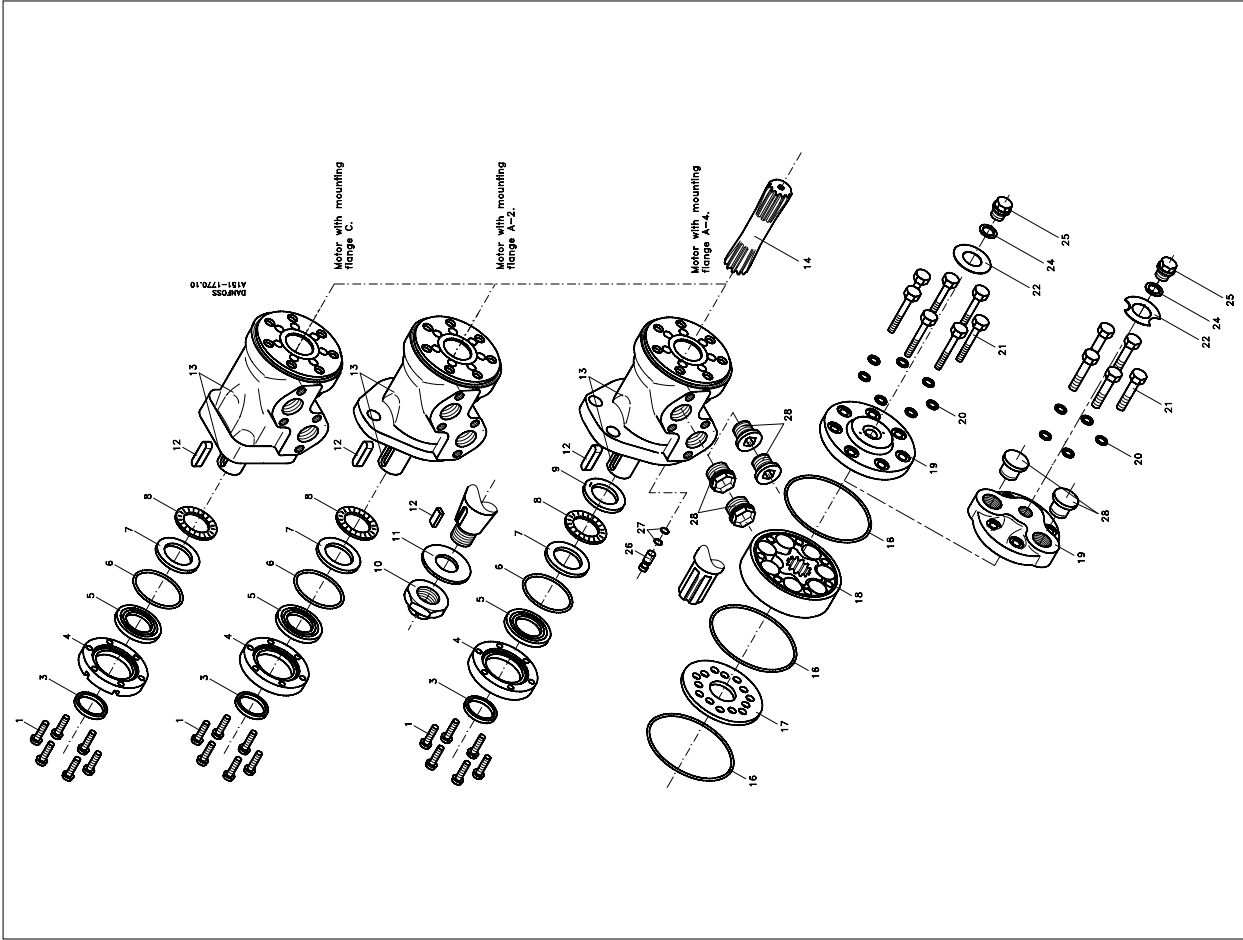
Australia	: Danfoss (Australia) Pty. Ltd., Melbourne
Austria	: Hainzl Industriesysteme, GmbH., Linz
Belgium	: N.V. Danfoss S.A., Bruxelles
Brazil	: Danfoss do Brasil Ind.e Com. Ltda., São Paulo
Canada	: Danfoss Mfg. Ltd., Mississauga
Denmark	: Danfoss Hydraulik A/S, Gørløse
Finland	: OY Danfoss AB, Espoo
France	: Danfoss S.a.r.l., Trappes (Paris)
Germany	: Danfoss GmbH., Offenbach/Main
Great Britain	: Danfoss Limited, Greenford (London)
Iceland	: Hedinn Verslun HF, Reykjavik
India	: Dantal Hydraulics PVT Ltd., New Delhi
Italy	: Danfoss s.r.l. Division Sordella, Torino
Japan	: Danfoss K.K., Gotemba
Korea	: Unitek Corporation, Seoul
Netherlands	: Itho B.V., Schiedam
New Zealand	: Danfoss (New Zealand) Limited, Auckland
Norway	: Danfoss A/S, Skui
Republic of South Africa	: Danfoss (Pty) Ltd., Johannesburg
Singapore	: Danfoss Industries Pte. Ltd., Singapore
Spain	: Danfoss S.A., San Sebastian de los Reyes, (Madrid)
Sweden	: Danfoss AB, Mjölby
Switzerland	: Danfoss Werner Kuster AG, Frenkendorf
Turkey	: Mert Teknik A.S., Istanbul
U.S.A.	: Danfoss Fluid Power Div. Racine, Wisconsin
Australia	: Danfoss (Australia) Pty. Ltd., Adelaide
Australia	: Danfoss (Australia) Pty. Ltd., Brisbane
Australia	: Danfoss (Australia) Pty. Ltd., Perth
Australia	: Danfoss (Australia) Pty. Ltd., Sydney
Czech Rep.	: Techno Trade, Olomouc
Greece	: A. Skoura & Co. E.E., Athens
New Zealand	: Danfoss (New Zealand) Limited, Christchurch
Taiwan	: Symbridge Machinery Co. Ltd., Taipei

Service Shops

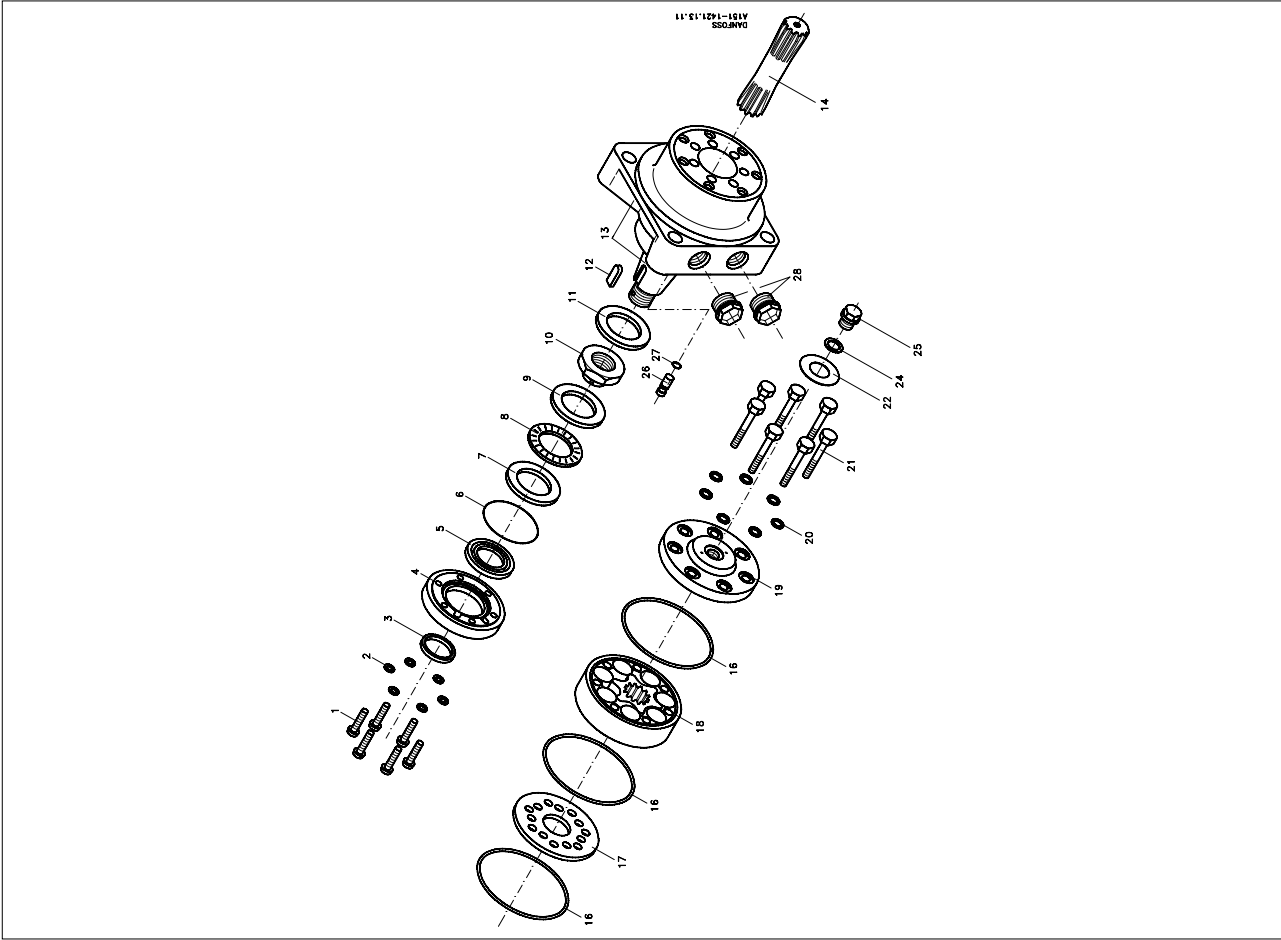
Exploded view OMR
Metric version, series 6 with integrated spigot flange



Exploded view
OMR and OMR C
Metric version, series 5 and 6 with separate spigot flange



Exploded view OMRW N Metric version, series 5 and 6



Item	Spare parts	Dimension	Code no.	Number per motor						
				Series 6*	Series 5 and 6 with separate spigot flange					
				OMR Flange A2	OMR Flange A2	OMR C Flange A2	OMR Flange A4	OMR Flange C	OMR OMRW N	OMRW
1	Screw	M6: L = 16 mm M5: L = 16 mm M6: L = 16 mm M6: L = 25 mm	681X1989 681X1961 681X0247 681X1454		6	6	6	6	6	6
2	Washer	9,9 x 6,1 x 0,5 mm	684X2047							6
3	Dust seal ring Ø25 mm, Ø1", 1" spl. shaft Ø25 mm, Ø1", 1" spl. shaft 28,5 mm tapered shaft Ø25 mm shaft Ø32 mm shaft	35,0 x 27,5 x 2,2 mm 35,0 x 27,5 x 4,0 mm 35,0 x 28,5 x 4,0 mm 35,0 x 28,5 x 4,0 mm 42,0 x 35,0 x 3,5 mm	633B0370 151-1313 633B0010 633B3198	1	1	1	1	1	1	1
4	Spigot flange Ø25 mm, Ø1", 1" spl. shaft (HPS) Ø25 mm, Ø1", 1" spl. shaft Ø25 mm shaft Ø25 mm shaft Ø32 mm shaft, (HPS) Ø32 mm shaft 35 mm tapered shaft		151-5588 151-5458 151-5473 151-1827 151-5589 151-1734 151-1988		1	1	1	1	1	1
5	Shaft seal Ø25 mm, Ø1", 1" spl. shaft (HPS) Ø25 mm, Ø1", 1" spl. 28,5 mm tapered shaft Ø25 mm, Ø1", 1" splined 28,5 mm tapered shaft Ø32 mm shaft, (HPS) Ø32 mm shaft, 35 tapered shaft	39 x 28,6 x 4,9 mm, HSN 42,0 x 28,6 x 5,5 mm, NBR 42,0 x 28,6 x 5,5 mm, FPM 46 x 35 x 4,9 mm 48,0 x 35,0 x 5,5 mm, NBR	633B0414 633B3385 633B0323 633B0415 633B3273	1	1	1	1	1	1	1
6	O-ring Ø25 mm, Ø1", 1" spl. 28,5 mm tapered shaft Ø25 mm Ø32 mm shaft Ø35 mm tapered shaft	47,2 x 3,5 mm, NBR 48,0 x 2,0 mm, NBR 53,0 x 2,0 mm, NBR	633B1191 633B1333 633B1528 633B0063		1	1	1	1	1	1
7	Bearing race Ø25 mm, Ø1", 1" splined, shaft Ø25 mm, Ø1", 1" splined, shaft 28,5 mm tapered shaft Ø32 mm shaft Ø35 mm tapered shaft	41,6 x 29 x 4 47,5 x 29,5 x 3,0 mm 52,0 x 35,0 x 3,5 mm	151-5708 151-1608 151-1701	1	1	1	1	1	1	1
8	Axial needle bearing Ø25 mm, Ø1", 1" spl. shaft Ø25 mm, Ø1", 1" spl. shaft 28,5 mm tapered shaft Ø32 mm shaft Ø35 mm tapered shaft	42 x 28,7 x 4,5	151-5709 151-1458 981X3198	1	1	1	1	1	1	1

NBR: (Buna N, Perbunan) FPM: Viton (ISO 1629) HPS: High pressure shaft seal * Series 6 with integrated spigot flange

Item	Spare parts	Dimension	Code no.	Number per motor							
				Series 6*							
				OMR Flange A2	OMR Flange A2	OMR C Flange A2	OMR Flange A4	OMR Flange C	OMRW OMRW N		
9	<u>Bearing race</u> Ø32 mm shaft, Ø35 mm tapered shaft	52,0 × 35,0 × 3,5 mm	151-1701	1			1				1
10	<u>Castellated nut</u> 28,5 mm tapered shaft Ø35 mm tapered shaft	M20 × 1,5 M20 × 1,5	681X8202 681X8235	1							1
11	<u>Washer</u> for 28,5 mm tapered shaft Ø35 mm tapered shaft	44,0 × 20,5 × 4,0	684X2530	1							1
12	<u>Parallel key</u> for Ø25 mm shaft for Ø25 mm shaft for Ø1" shaft for Ø32 mm shaft for 28,5 mm tapered shaft Ø35 mm tapered shaft	A8 × 7 × 32 mm, DIN 6885 A8 × 7 × 31 mm 1/4 × 1/4 × 1 1/4 inch, B.S.46 A10 × 8 × 45 mm, DIN 6885 B5 × 5 × 14 mm, DIN 6885 B6 × 6 × 20 mm, DIN 6885	682L8035 682L9007 682L8036 682L8019 682L8016 682L8021	1 1 1 1 1	1		1	1	1	1	1
13	Housing + output shaft										
14	<u>Cardan shaft</u> OMR 50 OMR 80 OMR 80 OMR 100 OMR 100 OMR 125 OMR 125 OMR 160 OMR 160 OMR 200 OMR 200 OMR 250 OMR 250 OMR 315 OMR 315 OMR 375 OMR 375	L = 96,6 mm L = 79,7 mm L = 101,0 mm L = 84,4 mm L = 104,5 mm L = 87,8 mm L = 109,0 mm L = 92,2 mm L = 115,0 mm L = 98,3 mm L = 122,0 mm L = 105,3 mm L = 131,0 mm L = 114,0 mm L = 142,0 mm L = 125,4 mm L = 152,5 mm L = 135,6 mm	151-1812 151-2652 151-1813 151-2653 151-1814 151-2654 151-1815 151-2655 151-1816 151-2656 151-1817 151-2657 151-1818 151-2658 151-1819 151-2659 151-1820 151-2660	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1	1	1	1	1	1	1
16	O-ring	90,0 × 2,0 mm, NBR	633B1301	3	3	3	3	3	3	3	3
17	Distributor plate		151-1702	1	1	1	1	1	1	1	1
18	<u>Gear wheel set</u> OMR 50 OMR 80 OMR 100 OMR 125 OMR 160 OMR 200 OMR 250 OMR 315 OMR 375	W = 9,0 mm W = 14,0 mm W = 17,4 mm W = 21,8 mm W = 27,4 mm W = 34,8 mm W = 43,5 mm W = 54,8 mm W = 65,0 mm	151-1182 151-1138 151-1139 151-1140 151-1141 151-1189 151-1190 151-1191 151-1192	1 1 1 1 1 1 1 1 1	1	1	1	1	1	1	1

NER: (Buna N, Perbunan) FPM: Viton (ISO 1629) HPS: High pressure shaft seal * Series 6 with integrated spigot flange

NBR: (Buna N, Perbunan) FPM: Viton (ISO 1629) HPS: High pressure shaft seal * Series 6 with integrated spigot flange

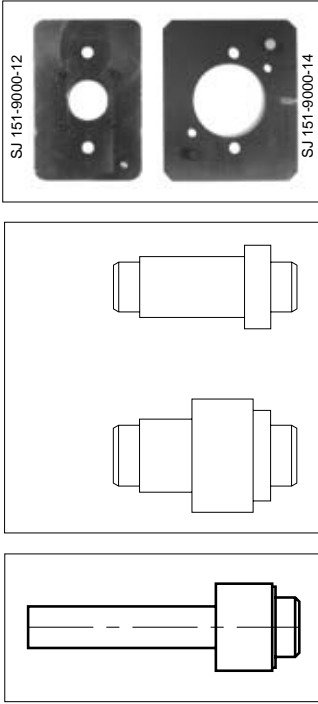
Item	Spare parts	Dimension	Code no.	Number per motor							
				Series 6"				Series 5 and 6 with separate spigot flange			
				OMR Flange A2	OMR Flange A2	OMR Flange A2	OMR Flange A2	OMR Flange A4	OMR Flange C	OMRW OMRW N	
19	End cover Side port motor without drain Side port motor End port motor		150-5568 151-1659 151-1833	1 1	1 1	1 1	1 1	1 1	1 1	1 1	
20	Washer Side port motor End port motor	11,9 × 8,2 × 1,0 mm 11,9 × 8,2 × 1,0 mm	684X0076 684X0076	7 7	7 5	7 7	7 7	7 7	5 5	7 7	
21	Screw Side port motor OMR 50 OMR 80 OMR 100 OMR 125 OMR 160 OMR 180 OMR 200 OMR 250 OMR 315 OMR 375 End port motor OMR 50 OMR 80 OMR 100 OMR 160 OMR 200 OMR 250 OMR 315 OMR 375	M8 × 1,25 l = 40mm l = 45 mm l = 45 mm l = 50 mm l = 55 mm l = 65 mm l = 65 mm l = 75 mm l = 85 mm l = 95 mm M8 × 1,25 l = 45 mm l = 50 mm l = 55 mm l = 65 mm l = 70 mm l = 80 mm l = 90 mm l = 100 mm	681X0180 681X0181 681X0181 681X0182 681X0183 681X0184 681X0185 681X0187 681X0189 681X0190 681X0181 681X0182 681X0183 681X0185 681X0186 681X0188 681X0239 681X0240	7 7 7 7 7 7 7 7 7 7 7 5 5 5 5 5 5 5 5 5	7 7 7 7 7 7 7 7 7 7 7 5 5 5 5 5 5 5 5 5	7 7 7 7 7 7 7 7 7 7 7 5 5 5 5 5 5 5 5 5	7 7 7 7 7 7 7 7 7 7 7 5 5 5 5 5 5 5 5 5	7 7 7 7 7 7 7 7 7 7 7 5 5 5 5 5 5 5 5 5	7 7 7 7 7 7 7 7 7 7 7 5 5 5 5 5 5 5 5 5	7 7 7 7 7 7 7 7 7 7 7 5 5 5 5 5 5 5 5 5	
22	Name plate Side port motor - aluminium Side port motor - brass End port motor - aluminium		151A0411 151A0412 151A0417	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	
24	Washer	17,5 × 13,5 × 1,5 mm	684X2120	1	1	1	1	1	1	1	
25	Drain plug		151-1524		1	1	1	1	1	1	
26	Check valve incl. item 27		151-1076 15 -1995		2	2	2	2	2	2	
27	O-ring	5,0 × 1,5 mm, NBR	633B1324		4	4	4	4	4	4	
28	Plug Side port motor- plastic plug End port motor - steel plug End port motor - plastic plug		633X0074 631X9706 633X0074	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	
NBR: (Buna N, Pertunan) FPM: Viton (ISO 1629) HPS: High pressure shaft seal * Series 6 with integrated spigot flange											

NBR: (Buna N, Perbunan) FPM: Viton (ISO 1629) HPS: High pressure shaft seal * Series 6 with integrated spigot flange

Special tools



Main holding tool (horse hole):
Code No.: SJ 151-9000-1.



Mandrel: Code No.:
SJ 151-0414

Holding tool for motor with
square mounting flange:
Code No.: SJ 151-9000-12.

Holding tool for OMRW N.
Code No.: SJ 151-9000-14.

Dismantling

Item	Part to remove	Comments
10	Castelated nut	
11	Washer	
12	Parallel key	
28	Seal plugs	Placer motor i holdeværktøj med udgangsaksel nederst. Ved endoporsversion benyttes 10 mm unbrakonøgle. Put the motor in a holding tool with the output shaft downward. For end port version use 10 mm hexagon socket spanner. Den Motor mit der Abtriebswelle nach unten im Haltewerkzeug anbringen. Bei der Ausführung mit Endanschlüssen 10 mm Sechskantschlüssel verwenden. Placer moteur dans l'outil abtre de sortie vers le bas. Pour la version avec orifice à l'arrière, utiliser une clé Allen de 10 mm.
25, 24	Drain plug, washer (If present)	Benyt 19 mm topnøgle. Use a 19 mm spanner socket. Einen 19 mm Steckschlüssel verwenden Utiliser clé à douille 19 mm.

Item	Spare parts	Dimension	Code no.	Number per motor					
				Series 6* OMR Flange AZ	OMR Flange AZ	OMR C Flange AZ	OMR Flange AZ	OMR Flange C	OMRW N
	Spare parts bag for motors with HPS and Ø25 mm, Ø1", 1" spl. shaft (Series 5/6)		151-1286	1					
3	1 pcs. Dust seal	35 x 27.5 x 2.2 mm	NBR						
5	1 pcs. Shaft seal (Series 7/8)	39 x 28.6 x 4.9 mm	HSN						
6	1 pcs. O-ring	47.2 x 3.5 mm	NBR						
6	1 pcs. O-ring	48 x 2 mm	NBR						
16	3 pcs. O-ring	75.9 x 1.8 mm	NBR						
16	3 pcs. O-ring	90 x 2 mm	NBR						
20	7 pcs. Washer	11.9 x 8.2 x 1 mm							
	Spare parts bag for motors with standard shaft seal and Ø25 mm, Ø1", 1" spl. shaft (Series 4/5 and 6)		151-1277	1	1	1**	1	1	1
3	1 pcs. Dust seal	32 x 27.0 x 4.0 mm	NBR						
5	1 pcs. Shaft seal (Series 5/6)	42 x 28.6 x 5.5 mm	NBR						
5	1 pcs. Shaft seal (Series 4)	48 x 28.6 x 6.0 mm	NBR						
6	1 pcs. O-ring	47.2 x 3.5 mm	NBR						
6	1 pcs. O-ring	48 x 2.0 mm	NBR						
16	3 pcs. O-ring	90.0 x 2.0 mm	NBR						
20	7 pcs. Washer	11.9 x 8.2 x 1.0							
24	1 pcs. Washer	17.5 x 13.5 x 1.5							
	Spare part bag for motors with Ø35 mm shaft (Series 4/5 and 6)		151-1166		1		1		1
2	6 pcs. Washer	9.0 x 6.1 x 0.5 mm							
3	1 pcs. Dust seal	42 x 35 x 3.5 mm	NBR						
5	1 pcs. Shaft seal	48 x 35 x 5.5 mm	NBR						
6	1 pcs. O-ring	53 x 2 mm	NBR						
6	1 pcs. O-ring	74.0 x 2.0 mm	NBR						
16	3 pcs. O-ring	90.0 x 2.0 mm	NBR						
20	7 pcs. Washer	11.9 x 8.2 x 1.0							
24	17.5 x 13.5 x 1.5 mm		684X2120						

NBR: (Buna N, Perbunan) FPM: Viton (ISO 1629) HPS: High pressure shaft seal

* Series 6 with integrated spigot flange

** Excl. dust seal ring 633B0010

Tightening torque

Item	Code Number	Torque (daNm)	Torque (lbf in)
1	681X1989	0.5 - 0.8	45 - 70
	681X0247	0.5 - 0.8	45 - 70
	681X1961	0.5 - 1.0	45 - 90
	681X1454	1.2 - 1.5	110 - 130
10	681X8202	9.0 - 11	800 - 1000
	681X8232	19 - 21	1680 - 1860
21	-	3.0 - 3.5	270 - 315
25	-	3.0 - 6.0	270 - 540
28	631X9706	5.0 - 7.0	445 - 620

NBR: (BUNA N, PERBUNAN).

Dismantling

Item	Part to remove	Comments
21, 20	Screws, washers	Benyt 13 mm topnøgle. Use a 13 mm spanner socket. Einen 13 mm Steckschlüssel verwenden. Utiliser clé à douille 13 mm.
19	End cover	Fjern endedækslet sideværts. Remove end cover sideways. Den Enddeckel seitwärts entfernen. Enlever le couvercle latéralement.
18, 16	Gear wheel set O-rings (2 off)	Hold fingrene under tandhjulssættet for at forhindre delene i at falde ud. Keep fingers under the gearwheel set to prevent the parts from falling out. Die Finger unter dem Zahnradsatz halten, um zu verhindern, daß Teile herausfallen. Tenir le jeu d'engrenages par dessous pour ne pas perdre de pièces.
14	Cardan shaft	
17, 16	Distributor plate O-ring	
13	Output shaft	<p>Motører med integreret styreflange: Motorhus placeres på arbejdsbord og akslen presses ud af motorhuset. Akslen og lejer bør normalt ikke tages ud af OMRW N. Ønskes dette alligevel for inspektion og rengøring, tøres akslen forlæns ud af huset. Det bagerste leje, kan derved forblive i huset. Vend herefter motoren.</p> <p>Motors with integrated spigot flange: Place the motor housing on the work bench and press the shaft out of the motor housing. Shaft and bearings should normally not be removed from OMRW N. However, if necessary for inspection and cleaning, remove the shaft from the housing front end. The rear bearing can thus remain in the housing. After this, turn the motor.</p> <p>Motoren mit integriertem Dichtungsflansch: Das Motorgehäuse auf dem Arbeitstisch legen und die Welle aus dem Motorgehäuse pressen. Welle und Lager sollten normalerweise nicht von OMRW N entfernt werden. Wenn aber notwendig zwecks Inspektion und Reinigung, die Welle vorwärts aus dem Gehäuse führen. Das hintere Lager kann somit im Gehäuse bleiben. Hiernach den Motor wenden.</p> <p>Moteur avec plaque porte joint intégrée: Placer le carter moteur sur l'établi et poussez sur l'arbre pour la faire sortir du carter moteur. Normalement, il ne faut pas enlever l'arbre et les paliers de l'OMRW N, mais au besoin, pour permettre l'inspection et le nettoyage, faire sortir l'arbre du carter par l'avant. Le palier arrière peut ainsi rester dans le carter. Retourner ensuite le moteur.</p>

Dismantling

Item	Part to remove	Comments
1	Screws (6 off)	Anvend Torx-nøgle type T30, 9 mm skruetrækker eller 4 mm unbrakonøgle. Use Torx-spanner type T30, 9 mm screwdriver or 4 mm hexagon socket spanner. Werkzeug: Torx-Schlüssel Typ T30, 9 mm Schraubenzieher oder 4 mm Sechskantschlüssel. Utiliser: Clé Torx type T30, tournevis de 9 mm ou clé Allen de 4 mm.
2	Washer (6off)	Kun OMRW N Only OMRW N Nur OMRW n S'applique seulement aux OMRW N
4	Spigot flange	
6, 7	O-ring, bearing race	<p>Motører med integreret styreflange: Fjern leje og løbeskive fra motorhuset. Motører med separat styreflange: Anvend 2 mm skruetrækker</p> <p>Motors with integrated spigot flange: Remove bearing and bearing race from the motor housing. Motors with separate spigot flange: Use a 2 mm screwdriver.</p> <p>Motoren mit integriertem Dichtungsflansch: Lager und Scheibe aus dem Motorgehäuse entfernen. Motoren mit separatem Dichtungsflansch: Einen 2 mm Schraubenzieher verwenden.</p> <p>Moteur avec plaque porte joint intégrée: Retirez les butées et la butée à billes du carter moteur. Moteur avec plaque porte joint séparée: Utiliser un tournevis de 2 mm.</p>
8	Needle bearing	
5 3	Shaft seal Dust seal	<p>Motører med integreret styreflange: Slå pakdåsen forsigtigt ud med dorn og plashammer. Motører med separat styreflange: Slå aksepakning / støvræmningsring ud med plashammer. Brug dorn SJ 151-9000-7 eller SJ 151F9000-7.</p> <p>Motors with integrated spigot flange: With mandrel and plastic hammer, carefully knock out the shaft seal. Motors with separate spigot flange: Knock out the shaft seal / dust seal with a plastic hammer. Use mandrel SJ 151-9000-7 or SJ 151F9000-7.</p> <p>Motoren mit integriertem Dichtungsflansch: Die Dichtung vorsichtig mit Dorn und Plashammer heraus schlagen Motoren mit separatem Dichtungsflansch: Die Wellendichtung / Staubdichtung mit Kunststoffhammer heraus schlagen. Verwenden Sie Dorn SJ 151-9000-7 oder SJ 151F9000-7.</p>

Dismantling

Item	Part to remove	Comments
5 3	Shaft seal Dust seal	Moteur avec plaque porte joint intégrée: A l'aide d'un marteau en plastic et d'un emporte-pièce, chassez délicatement le joint d'arbre Moteur avec plaque porte joint séparée: Faites sortir les joint d'arbre/anti-poussière à l'aide d'un marteau plastique. Utilisez l'outil SJ 151-9000-7 ou SJ 151F9000-7.
9	Bearing race	Kun OMR/OMRW N med Ø32mm/28,5 mm konisk aksel. Anvend 2 mm skrue/rækker. Only OMR/OMRW N with Ø32 mm/28.5 mm tapered shaft. Use a 2 mm screwdriver. Nur OMR/OMRW N mit Ø32 mm/28.5 mm kegelige Welle. Einen 2 mm Schraubenzieher verwenden. Seulement OMR/OMRW N avec Ø32 mm/arbre conique de 28,5 mm. Utilisez tournevis de 2 mm.
26	Check valves (2 off)	Kun OMR med kontraventiler Træk kontraventilerne ud med fx en nedslæbet (afkortet) 3,5 mm snittap. Only OMR with check valves Pull the check valve out with, for example, a ground (shortened) 3.5 mm screw tap. Nur OMR mit Rückschlagventilen Die Rückschlagventile herausziehen, z.B. mit einem abgeschliffenen (verkürzten) 3,5 mm Gewindebohrer. Seulement OMR avec des clapets anti-retour Pour les sortir, utiliser par ex. un taraud 3,5 mm (raccourci).

Rensning

Rengør omhyggeligt alle dele i aromatfattig petroleum.

Kontrol og udskiftning

Kontroller omhyggeligt alle dele og skift dem ud hvis nødvendigt.

Smøring

Smør alle enkeltdele ind i hydraulikolie før samling og indfædt gummidiele med vaseline.

Cleaning

Clean all parts carefully with low aromatic kerosene.

Inspection and replacement

Check all parts carefully and replace if necessary.

Lubrication

Before assembly, lubricate all parts with hydraulic oil and grease rubber parts with vaseline.

Reinigung

Alle Teile sorgfältig in aromatarmer Petroleum reinigen.

Kontrolle und Auswechslung

Alle Teile sorgfältig kontrollieren und falls notwendig, auswechseln.

Schmieren

Alle Einzelteile vor der Montage mit Hydrauliköl einschmieren, und die Gummiteile mit Vaseline einfetten.

Nettoyage

Nettoyer soigneusement toutes les pièces dans du pétrole à faible teneur en additifs.

Vérification et remplacement

Vérifier soigneusement toutes les pièces et les remplacer s'il y a lieu.

Lubrification

Avant le remontage, enduire toutes les pièces d'huile hydraulique, et graisser les pièces de caoutchouc avec de la vaseline.

Assembly

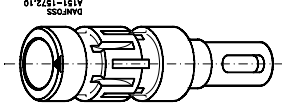
Item	Part to mount	Comments
		Placer motorhuset i holderværktøjet med flangen øverst. Place the motor housing in the holding tool with the flange upwards. Das Motorgehäuse mit dem Flansch nach oben im Haltewerkzeug anbringen. Placer le carter du moteur dans l'outil, bride vers le haut. Kun OMR med kontraventiler Indfædt kontraventilerne (med nye O-ringe) og monter dem i borerne med lette slag af en plasthammer. Only OMR with check valves Grease the check valves (fitted with new O-rings) and fit them in their bores with light blows using plastic hammer. Nur OMR mit Rückschlagventilen Rückschlagventile (mit neuen O-Ringen) einfetten und mit leichten Schlägen mit einem Kunststoffhammer in den Bohrungen anbringen. Seulement OMR avec des clapets anti-retour Enduire de graisse les clapets antiretour avec nouveaux joints toriques et les mettre en place dans les alésages en tapant légèrement avec un marteau plastique.
26	Check valves (2 off)	
9	Bearing race	Kun OMR/OMRW N med Ø32mm/28,5 mm konisk aksel. Only OMR/OMRW N with Ø32 mm/28.5 mm tapered shaft. Nur OMR/OMRW N mit Ø32 mm/28.5 mm kegelige Welle. Seulement OMR/OMRW N avec Ø32 mm/arbre conique de 28,5 mm.
5	Shaft seal	Motør med integreret styreflange: Smør pakåsen med hydraulikolie indvendig og udvendig. Placer pakåsen korrekt på montagedorn SJ 151-0414 og pres den forsigtig på plads i motorhuset. Motør med separat styreflange: Slå pakningen på plads i styreflangen. Kontroller at pakningen lægger an mod dækslets reces. Brug dorn SJ 151-9000-7 eller SJ 151F9000-7. Motors with integrated spigot flange: Lubricate the shaft seal on the out side with hydraulic oil. Fit the shaft seal correctly onto mandrel SJ 151-0414 and carefully press the shaft seal into position in the motor housing. Motors with separate spigot flange: Knock the seal into position in the spigot flange. Check that the seal lies against the cover recess. Use mandrel SJ 151-9000-7 or SJ 151F9000-7. Motoren mit integriertem Dichtungsflansch: Die Wellendichtung mit Hydrauliköl auf Innen- und außenseite schmieren. Die Dichtung korrekt auf Dorn SJ 151-0414 anbringen und vorsichtig an ihren Platz im Motorgehäuse drücken. Motoren mit separatem Dichtungsflansch: Die Dichtung im Steuerflansch an ihren Platz schlagen. Kontrollieren, ob die Dichtung an der Vertiefung des Deckels anliegt. Verwenden Sie Dorn SJ 151-9000-7 oder SJ 151F9000-7. Moteur avec plaque porte joint intégrée: Lubrifier le joint d'arbre sur sa contour extérieur avec de l'huile hydraulique. Positionnez-le sur correctement l'outil SJ 151 0414 et positionnez délicatement le joint d'arbre dans le carter moteur. Moteur avec plaque porte joint séparée: Placer le joint dans la bride de centrage et taper pour le mettre en place; s'assurer qu'il est bloé dans le recés. Utiliser pointeau SJ 151-9000-7 ou SJ 151F9000-7.

Assembly

Item	Part to mount	Comments
3	Dust seal ring	Anbring støvtaetningsringen i styreflangen og bank den på plads med en plasthammer og passende dorn. SJ 151-9000-7 eller SJ 151F9000-7. Place the dust seal ring in the spigot flange and knock it into position with a plastic hammer and appropriate mandrel. SJ 151-9000-7 or SJ 151F9000-7. Den Staubdichtungsring im Steuerflansch anbringen und mit einem Kunststoffhammer und passendem Dorn an seinen Platz schlagen. SJ 151-9000-7 oder SJ 151F9000-7. Placer le joint anti-poussière dans bride de centrage et le taper en place avec marteau plastique et pointeau adéquat. SJ 151-9000-7 ou SJ 151F9000-7.
7, 6	Bearing race, O-ring	Motors with integrated styreflange: Leje og løbskive placeres på akslen og monteres sammen med denne. Motors with separate styreflange: Indfædt O-ring i vaseline og monter løbskiven og O-ringen i styreflangen. Motors with integrated spigot flange: Fit bearing and bearing race onto the shaft and mount together with the shaft. Motors with separate spigot flange: Grease the O-ring with vaseline and fit the bearing race and O-ring into the spigot flange. Motoren mit integriertem Dichtungsflansch: Lager und Scheibe auf die Welle platzieren und zusammen ein bauen. Motoren mit separatem Dichtungsflansch: O-Ring mit Vaseline einleiten und Laufscheibe und O-Ring im Zentrierflansch montieren. Moteur avec plaque porte joint intégrée: Monter les butées et la butée à billes sur l'arbre et monter l'ensemble dans le carter moteur. Moteur avec plaque porte joint séparée: Enduire le joint torique de vaseline et monter la butée à billes et le joint torique dans la plaque porte joint.
8	Needle bearing	
4	Spigot flange	Drej så hullerne flugter. Turn so that the holes line up. So drehen, daß die Löcher fluchten. Ajuster pour aligner les trous.
2	Washer	Kun OMRW N Only OMRW N Nur OMRW N Seulement OMRW N

Assembly

Item	Part to mount	Comments
1	Screws (6 off)	Tilspændingsmoment Torx skruer M6 : 0,5-0,8 daNm Kørviskruer M6 : 0,5-0,8 daNm Unbrakoskruer M5 : 0,5-1,0 daNm Unbrakoskruer M5 : 1,2-1,5 daNm Vend herefter motoren. Tightening torque Torx screws M6 : 0,5-0,8 daNm(45-70 lbf in (in-lbs)) Storted screws M6 : 0,5-0,8 daNm (45-70 lbf in (in-lbs)) Hexagon socket screws M5: 0,5-1,0 daNm (45-70 lbf in (in-lbs)) Hexagon socket screws M5: 1,2-1,5 daNm (45-70 lbf in (in-lbs)) After this, turn the motor. Anzugsmoment Torx Schrauben M6 : 0,5-0,8 daNm Schlitzschrauben M6 : 0,5-0,8 daNm Sechskantschrauben M5: 0,5-1,0 daNm Sechskantschrauben M5: 1,2-1,5 daNm Hiernach den Motor wenden. Couple de serrage vis Torx M6 : 0,5-0,8 daNm vis à encodche M6: 0,5-0,8 daNm vis Allen M5 : 0,5-1,0 daNm vis Allen M5 : 1,2-1,5 daNm Retourner ensuite le moteur.
13	Output shaft	Akselsølene smøres med hydraulikolie. På akselenden skal der markeres et punkt lodret over et kommu- teringsspor der har forbindelse til forreste ringkanal. Akslen på OMRW N føres bagfra ind i motorhuset med det bagerste nåleleje monteret på akslen. Slå med lette slag med plasthammer på akslen til den flugter med husets bagside. Kontroller at akslen nemt drejer rundt. Grease the journals with hydraulic oil. The rear shaft end must be marked before fitted. The mark must be positioned vertically above a commutation slot leading up to the front annular channel. For OMRW N, guide the shaft into the motor housing back with the rear needle bearing fitted on the shaft. Bring the shaft in line with the back of the motor by gently tapping the shaft with a plastic hammer. Check that the shaft rotates easily Die Gleitlager mit Hydrauliköl einschmieren. Am Wellenende muß senkrecht über eine Kommutierungsritze, die Verbindung mit dem vorderen Ringkanal hat, eine Markierung gemacht werden. Bei OMRW N, die Welle von hinten in das Gehäuse einführen, indem das hintere Nadelager auf der Welle montiert ist. Der Welle leichte Schläge eines Kunststoffhammers zufügen, um sie mit der Rückseite des Gehäuses zu fluchten zu bringen. Kontrollieren, daß die Welle unbehindert dreht. Enduire les tourillons de l'huile pour systèmes hydrauliques. Pour arbres marquer au bout de l'arbre arrière la position qui se trouve verticalement à une voie de commutation liée au canal annulaire placé en tête. Pour l'OMRW N, faire entrer l'arbre par l'arrière dans le carter du moteur, la butée à aiguilles arrière étant montée sur l'arbre. Faire affluer l'arbre et l'arrière du carter en frappant légèrement sur l'arbre avec un marteau plastique. Vérifier que l'arbre tourne facilement.



Assembly

Item	Part to mount	Comments
16	O-ring	Indfækt O-ring og læg den i husets O-ringsrille. Grease the O-ring and put it in the O-ring groove of the housing. Den O-Ring einfetten und in die O-Ring-Rille des Gehäuses legen. Graisser le joint et le placer dans sa rainure dans le carter.
17	Distributor plate	Drej fordelepladen, så hullerne flugter. Turn the distributor plate so that the holes line up. Die Verteilerplatte so drehen, daß die Löcher fluchten. Ajuster la plaque de distribution pour aligner les trous.
14	Cardan shaft	Før kardanakslen ned i motorhuset. Når der er forskel på splinelængden, vendes kardanakslen således, at den lange splinende monteres i udgangsakslens. Overfør markering fra udgangsaksel til kardanaksel. Guide the cardan shaft down into the motor housing. In case of different splines lengths turn the cardan shaft to ensure the long splines end is fitted in the output shaft. Transfer marking from output shaft to cardan shaft. Kardanwelle in das Motorgehäuse einführen. Bei unterschiedlichen Verzahnungslängen ist die Kardanwelle so zu richten, daß lange Verzahnungsendstück in der Abtriebswelle montiert wird. Die Markierung von der Abtriebswelle auf die Kardanwelle übertragen. Glisser l'arbre à cardan dans le carter du moteur. Si les cannelures sont différentes de longueur, tourner l'arbre à cardan de façon que l'extrémité cannelée la plus longue est montée dans l'arbre de sortie. Reporter le marquage de l'arbre de sortie à l'arbre à cardan.

Assembly

Item	Part to mount	Comments
18, 16	Gearwheel set, O-rings	Placer O-ringene (indfættet) i tandkransens O-ringsriller. I de tandhjul hvor splines ikke er gennemgående, vendes tandhjulet så fridrejning vender ned mod huset. Placer tandhjulssættet på kardanakslen, så en tandtop i tandhjulsets udvendige fortanding er lodret over mærket på kardanakslen. Drej tandhjulssættet mod uret indtil kardanakslen og tandhjul går i indgreb (15°). Drej tandkransen, så hullerne til skrueerne flugter. Place the O-rings (greased) in the O-ring grooves of the gearwheel. In gearwheels with non through splines place the gearwheel with the recess in the spline hole facing down towards the housing. Place the gearwheel set on the cardan shaft so that the top of a tooth in the external teeth of the gearwheel are vertically above the mark on the cardan shaft. Turn the gearwheel set counter clockwise until the cardan shaft and the gearwheel start to mesh (15°). Turn the gearwheel rim so that the holes made for the screws line up. Die O-Ringe (eingefettet) in den O-Ring-Rillen des Zahnkranzes anbringen. Einen Zahnradatz mit Zahannrad ohne durchgehende Verzahnung so wenden daß die Seite ohne Verzahnung gegen das Motorgehäuse gekehrt ist. Den Zahnradatz so auf der Kardanwelle anbringen, daß sich ein Zahnkopf in der Aussenzahnung des Zahnrads senkrecht über der Markierung der Kardanwelle befindet. Den Zahnradatz gegen den Uhrzeigersinn drehen, bis Kardanwelle und Zahnrad im Eingriff sind (15°). Den Zahnradkranz drehen, bis die Schraubenlöcher fluchten. Placer les joints toriques (graissés) dans leurs rainures dans la couronne dentée. Si les cannelures ne sont pas du type traversant, orienter la roue dentée avec la gorge de dégagement contre le carter. Placer le jeu d'engrenages sur l'arbre à cardan de façon à ce qu'un sommet de dent de la denture extérieure du rotor se trouve au-dessus de la rainure dans l'arbre à cardan. Tourner le jeu d'engrenages en sens inverse d'horloge jusqu'à engagement de l'arbre à cardan dans la roue dentée (15°). Tourner la couronne dentée pour faire aligner les trous à vis.
19	End cover	Drej enddækslet så hullerne flugter. Turn the end cover so that the holes line up. Den Enddeckel so drehen, daß die Löcher fluchten. Tourner le couvercle pour faire aligner les trous.

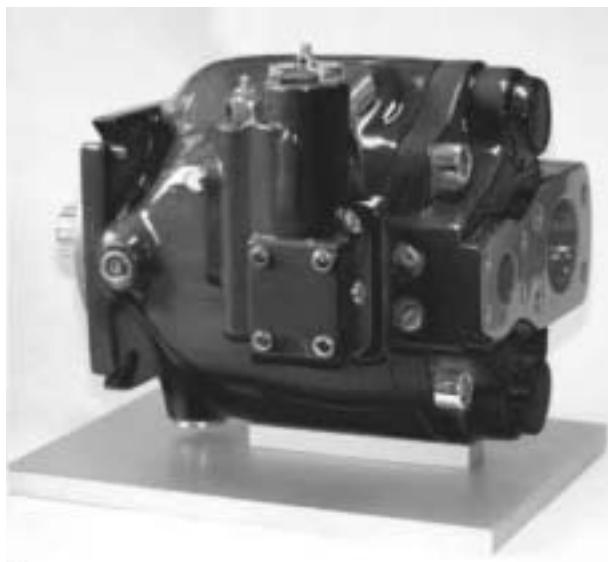
Assembly

Item	Part to mount	Comments
20, 21	Washer, screws	Benyt 13 mm topnøgle. Tilspændingsmoment: 3,0-3,5 daNm. Use a 13 mm spanner socket Tightening torque: 3,0-3,5 daNm (265-310 lbf in (in-lbs)). Den 13 mm Steckschlüssel verwenden. Anzugsmoment: 3,0-3,5 daNm. Utiliser clé à douille de 13 mm. Couple de serrage: 3,0 à 3,5 daNm.
24, 25	Washer, drain plug	Benyt 19 mm topnøgle. Tilspændingsmoment: 3 -6 daNm Use a 19 mm spanner socket Tightening torque: 3-6 daNm (270-315 lbf in). Den 19 mm Steckschlüssel verwenden. Anzugsmoment: 3-6 daNm. Utiliser clé à douille 19 mm. Couple de serrage: 3 à 6 daNm.
28	Seal plugs Threaded plug (If present)	<i>Endeportsversion</i> Skruplastpropper i endeportene. Skrupropperne i sideportene med 10 mm unbrakonøgle. Tilspændingsmoment: 5-7 daNm. <i>Sideportsversion:</i> Skruplastpropper i. <i>End port version:</i> Screw plastic plugs into end ports. Screw in the side port plugs using 10 mm hexagon socket spanner. Tightening torque: 5-7 daNm (445-620 lbf in (in-lbs)). <i>Side port version</i> Screw in plastic plugs. <i>Ausgabe mit Endanschlüssen</i> Kunststoffstopfen in die Endanschlüsse einschrauben. Stopfen in die Seitenanschlüsse mit 10 mm Sechskantsliffschlüssel einschrauben. Anzugsmoment: 5-7 daNm. <i>Ausgabe mit Seitenanschlüssen:</i> Kunststoffstopfen einschrauben. <i>Version avec orifice à l'arrière</i> Visser les bouchons dans les orifices arrière. Visser les bouchons dans les orifices latéraux avec une clé Allen de 10 mm. <i>Version avec orifices latéraux:</i> Visser les bouchons en place.
12	Parallel key	Sikres med tape eller plastring. To be secured with tape or plastic ring. Mit Tape oder Kunststoffstoff sichern. Attacher avec du scotch ou un anneau en matière plastique.
11	Washer	
10	Castelated nut	

5.25 HYDRAULIC PUMP (PARKER)

Location	ECL code	Reference
Hydraulic unit	1-10-861-21	PD 060 P B 04 S L S 5 A L2 0 T 0 0 B PB 00

NON CONTRACTUAL VIEW

**Pump**



Series 45
H Frame
Open Circuit
Axial Piston Pumps
Service Manual



Series 45 H Frame Open Circuit Axial Piston Pumps
Service Manual
Using this manual

ORGANIZATION AND
HEADINGS

To help you quickly find information in this manual, the material is divided into sections, topics, subtopics and details, with descriptive headings set in **red type**. Section titles appear at the top of every page in **large red type**. Topic headings appear in the left hand column in **BOLD RED CAPITAL LETTERS**. Subtopic headings appear in the body text in **bold red type** and detail headings in *italic red type*.

References (example: See *Topic xyz*, page XX) to sections, headings, or other publications are also formatted in *red italic type*. In Portable Document Format (**PDF**) files, these references represent clickable hyperlinks that jump to the corresponding document pages.

TABLES, ILLUSTRATIONS,
AND COMPLEMENTARY
INFORMATION

Tables, illustrations, and graphics in this manual are identified by titles set in *blue italic type* above each item. Complementary information such as notes, captions, and drawing annotations are also set in *blue type*.

References (example: See *Illustration abc*, page YY) to tables, illustrations, and graphics are also formatted in *blue italic type*. In PDF files, these references represent clickable hyperlinks that jump to the corresponding document pages.

SPECIAL TEXT
FORMATTING

Defined terms and acronyms are set in **bold black type** in the text that defines or introduces them. Thereafter, the terms and acronyms receive no special formatting.

Black italic type is used in the text to emphasize important information, or to set-off words and terms used in an unconventional manner or alternative context. *Red* and *blue italics* represent hyperlinked text in the PDF version of this document (see above).

TABLE OF CONTENTS

An indented **Table of Contents (TOC)** appears on the next page. Tables and illustrations in the TOC set in *blue type*. In the PDF version of this document, the TOC entries are hyperlinked to the pages where they appear.

© 2005 Sauer-Danfoss. All rights reserved. Printed in U.S.A.

Sauer-Danfoss accepts no responsibility for possible errors in catalogs, brochures and other printed material. Sauer-Danfoss reserves the right to alter its products without prior notice. This also applies to products already ordered provided that such alterations aren't in conflict with agreed specifications. All trademarks in this material are properties of their respective owners. Sauer-Danfoss and the Sauer-Danfoss logotype are trademarks of the Sauer-Danfoss Group.

Front cover illustrations: F101 348; F101 347; F101 346; P106 084

INTRODUCTION

Overview	5
Safety precautions	5
Unintended machine movement	5
Flammable cleaning solvents	5
Fluid under pressure	5
Personal safety	5
Symbols used in Sauer-Danfoss literature	6
General description	7
System circuit	8

**TECHNICAL
SPECIFICATIONS**

General specifications	9
Type of mounting	9
Auxiliary mounting pad options	9
Control options	9
Port options	9
Direction of rotation	9
Installation position	9
Technical specifications	9
General specifications (continued)	10
Hydraulic parameters	10
Inlet pressure	10
Pressure compensator valve setting	10
Case pressure	10
Hydraulic fluid	10
Temperature range	10
Hydraulic parameters (continued)	11
Displacement limiter	11
Auxiliary mounting pads	11
Input shafts	11
Fluid viscosity	11
Filtration	11

FEATURES

Control options	12
Operation	12
Control options	13

**PRESSURE
MEASUREMENT**

Required tools	14
Port locations and gauge installation	14

**INITIAL START-UP
PROCEDURES**

General	15
Start-up procedure	15

**FLUID AND FILTER
MAINTENANCE**

Recommendations	16
-----------------------	----

TROUBLESHOOTING

Excessive noise and / or vibration	17
Actuator response is sluggish	17
System operating hot	18
Low pump output flow	18
Pressure or flow instability	18
Pressure or flow instability (continued)	19
System pressure not reaching PC setting	19
High inlet vacuum	19

ADJUSTMENTS

PC second stage control	20
PC control	21
LS control	22

MINOR REPAIR

Shaft seal replacement	23
Removal	23
Installation	23
Auxiliary pads	24
Removal	24
Installation	24
Bias piston, servo piston, and optional displacement limiter	25
Pressure compensator valve	25
Disassembly	25
Old style	25
New style	25
Pressure compensator valve (continued)	26
Load spring control	26
Control	26
Servo and bias pistons and displacement limiter	27
Pressure compensator valve	27
Reassembly	27
Plug and fitting sizes and torques	28

OVERVIEW

This manual includes information for the installation, maintenance, and minor repair of the Series 45 frame H open circuit axial piston pumps. The manual includes a description of the units and their individual components, troubleshooting information, and minor repair procedures. Performing installation, maintenance, and minor repair of Series 45 H Frame axial piston pumps according to the procedures in this manual will not affect your warranty.

Performing minor repairs requires the unit to be removed from the vehicle/machine. Thoroughly clean the unit before beginning maintenance, or repair activities. Since dirt and contamination are the greatest enemies of any type of hydraulic equipment, follow cleanliness requirements strictly. This is especially important when changing the system filter and when removing hoses or plumbing.

A worldwide network of Sauer-Danfoss Authorized Service Centers (ASCs) is available for major repairs. Major repairs require the removal of the unit's endcap, which voids the warranty unless done by an ASC. Sauer-Danfoss ASCs are trained by the factory and certified on a regular basis. You can locate your nearest ASC using the distributor locator at www.sauer-danfoss.com

SAFETY PRECAUTIONS

Always consider safety precautions before beginning a service procedure. Protect yourself and others from injury. Take these general precautions whenever servicing a hydraulic system.

Unintended machine movement

▲ Warning
Unintended movement of the machine or mechanism may cause injury to the technician or bystanders. To protect against unintended movement, secure the machine or disable / disconnect the mechanism while servicing.

Flammable cleaning solvents

▲ Warning
Some cleaning solvents are flammable. To avoid possible fire, do not use cleaning solvents in an area where a source of ignition may be present.

Fluid under pressure

▲ Warning
Escaping hydraulic fluid under pressure can have sufficient force to penetrate your skin causing serious injury and/or infection. This fluid may also be hot enough to cause burns. Use caution when dealing with hydraulic fluid under pressure. Relieve pressure in the system before removing hoses, fittings, gauges, or components. Never use your hand or any other body part to check for leaks in a pressurized line. Seek medical attention immediately if you are cut by hydraulic fluid.

Personal safety

▲ Warning
Protect yourself from injury. Use proper safety equipment, including safety glasses, at all times.

SYMBOLS USED IN
SAUER-DANFOSS
LITERATURE

These symbols are in the illustrations and text of this manual. They communicate helpful information at the point where it is most useful to the reader.

In most instances, the appearance of the symbol itself denotes its meaning. The legend below defines the symbol and explains its purpose.

	WARNING may result in injury		Tip, helpful suggestion
	CAUTION may result in damage to product or property		Lubricate with hydraulic fluid
	Reusable part		Apply grease / petroleum jelly
	Non-reusable part, use a new part		Apply locking compound
	Non-removable item		Inspect for wear or damage
	Option – either part may exist		Clean area or part
	Superseded – parts are not interchangeable		Be careful not to scratch or damage
	Measurement required		Note correct orientation
	Flatness specification		Mark orientation for reinstallation
	Parallelism specification		Torque specification
	External hex head		Press in – press fit
	Internal hex head		Pull out with tool – press fit
	Torx head		Cover splines with installation sleeve
	O-ring boss port		Pressure measurement / gauge location or specification

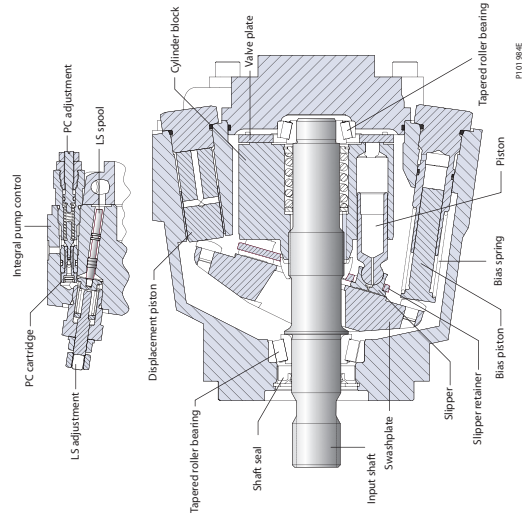
GENERAL DESCRIPTION

Sauer-Danfoss Series 45 H Frame open circuit piston pumps convert input torque into hydraulic power. Rotational force is transmitted through the input shaft to the cylinder block. The input shaft is supported by tapered roller bearings at the front and rear of the pump and is splined into the cylinder block. A lip-seal at the front end of the pump prevents leakage where the shaft exits the pump housing. The spinning cylinder block contains nine reciprocating pistons. Each piston has a brass slipper connected at one end by a ball joint. The slippers are held to the swashplate by the spring retainer and block spring. The block spring also holds the cylinder block to the valve plate. The reciprocating movement of the pistons occurs as the slippers slide against the inclined swashplate during rotation. One half of the cylinder block is connected to pump inlet and the other half to pump outlet, via the valve plate. As each piston cycles in and out of its bore, fluid is drawn from the inlet and displaced to the outlet thereby imparting power into the system circuit. A small amount of fluid is allowed to "leak" from the cylinder block / valve plate and slipper / swashplate interfaces for lubrication and cooling. Case drain ports are provided to return this fluid to the reservoir.

The volume of fluid displaced into the system circuit is controlled by the angle of the swashplate. The swashplate is forced into an inclined position (into stroke) by the bias piston and spring. The servo piston opposes the action of the bias piston and spring forcing the swashplate out of stroke when hydraulic pressure in the control circuit rises above the spring force.

The pump control, by varying the pressure at the servo piston, controls the displacement of fluid in the system circuit. Controls designed for **Pressure Compensation (PC)** are available. For a detailed description of control operation, refer to **Control options, operation**, page 13.

Pump and control sectional view



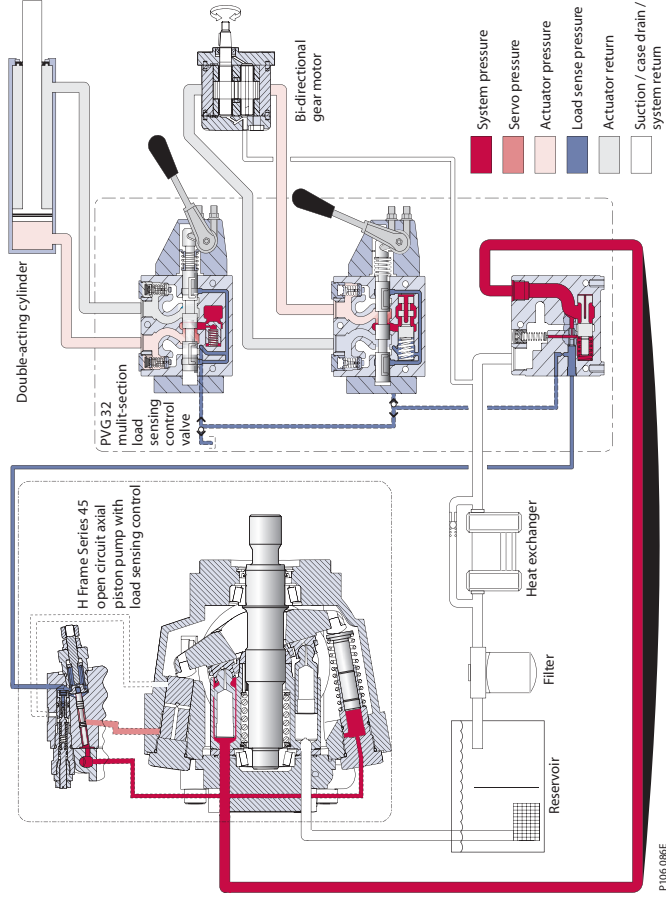
SYSTEM CIRCUIT

The pump receives fluid directly from the reservoir through the inlet line. A screen placed in the inlet protects the pump from large contaminants. The output of the pump is directed to a PVG-32 multi-section load sensing directional control valve which directs fluid to the actuators in the system. Fluid returning from the system is cooled by a heat exchanger and cleaned by a filter before returning to the reservoir.

The speed of the actuators in the system depends on the volume of fluid being provided by the pump. The operating pressure varies depending on actuator load but is limited to an adjustable maximum setting by the PC section of the pump control and by a system relief valve integrated into the side module of the PVG valve.

The position of the PVG valve sets the demand for flow in the system and communicates this to the pump control by means of a hydraulic signal (load sense signal). The pump will provide as much flow to the system as it demands while limiting the maximum pressure. Therefore flow and pressure in the system are compensated to meet requirements.

Pictorial circuit diagram



¹ Full available flow is a function of pump displacement, operating speed, and efficiency. Refer to **Series 45 Axial Piston Open Circuit Pumps Technical Information** 520L0519 for details.

GENERAL
SPECIFICATIONS

Type of mounting
SAE-C mounting flange.

Auxiliary mounting pad options
SAE-A, SAE-B, SAE-BB, SAE-C, SAE C-C

Control options
PC: Pressure Compensator
LS: Load Sensing (with PC)

Port options
Inlet and system ports: SAE flanged ports, code 61 Inlet Code 62 outlet.
Axial (end) ports or radial (side) ports.

All other ports: SAE straight thread O-ring boss.

Direction of rotation
Clockwise or counterclockwise.

Installation position
Installation position is discretionary. To satisfy inlet pressure conditions, it is recommended that the pump always be located below the lowest level of hydraulic fluid in the reservoir. The housing must always be filled with hydraulic fluid.

Technical specifications

Features and options		Model	
Feature	Unit	H57B	H75D
Maximum Displacement	cm ³ [in ³]	57 [3.48]	75 [4.58]
Flow at rated speed (theoretical)	l/min [US gal/min]	148.2 [39.2]	180 [47.5]
Input torque at maximum displacement (theoretical)	Nm/bar [US gal/min/1000 psi]	0.907 [55.4]	1.194 [729]
Mass moment of inertia of internal rotating components	kg·m ² [slug·ft ²]	0.00430 [0.00318]	0.00420 [0.00310]
Weight	Axial ports	24 [53]	
	Radial ports	27 [60]	
Rotation		Clockwise, Counterclockwise	
Mounting		SAE-B, SAE-C	
Auxiliary mounting		SAE-A, SAE-B, SAE-BB, SAE-C	
System ports (type)		SAE O-ring boss, 4-bolt split flange	
System ports (location)		Axial, Radial	
Control types		PC, LS, LS with internal bleed	
Shafts	Splined	13 tooth, 14 tooth, 15 tooth	
	Tapered	Ø 31.75 mm [1.25 in], 1:8 taper	
	Straight	Ø 31.75 mm [1.25 in]	
Displacement limiters		Optional, adjustable	

GENERAL
SPECIFICATIONS
(continued)

Rating		Units	Model	
Input speed ¹	minimum	min ⁻¹ (rpm)	H57B 500	H75D 500
	continuous		2600	2400
	maximum		3200	2800
Working pressure	continuous	bar [psi]	310 [4495]	210 [3045]
	maximum		400 [5800]	300 [4350]
External shaft loads	External moment (M _e)	N·m [lb·ft·in]	226 [2000]	
	Thrust in (T ₁), out (T ₂)	N [lbf]	2200 [495]	
Bearing life	at 140 bar [2030 psi]	B ₁₀ hours	29 712	10 755
	at 210 bar [3045 psi]		6834	2474
	at 260 bar [3770 psi]		3151	—
	at 310 bar [4495 psi]		1666	—
Mounting flange load moments	Vibratory (continuous)	N·m [lb·ft·in]	SAE-C: 1500 [14 000], SAE-B: 735 [6500]	
	Shock (max)		SAE-C: 5650 [50 000], SAE-B: 2600 [23 000]	

1. Input speeds are valid at 1 bar absolute [0 in Hg vac] inlet pressure. See *Inlet pressure vs. speed* charts.

HYDRAULIC
PARAMETERS

Inlet pressure

Minimum pressure, continuous = 0.8 bar absolute [6.7 inch Hg vac]
(at reduced maximum pump speed)

Minimum pressure, cold start = 0.5 bar absolute [15.1 inch Hg vac]

Pressure compensator valve setting
PC control setting range

Model	bar	psi
H57B	100–310	1450–4495
H75D	100–210	1450–3045

Case pressure

Maximum continuous: 0.5 bar [7 psi] Above inlet. Intermittent: 2 bar [29 psi] Cold start

Hydraulic fluid

Refer to Sauer-Danfoss publication *Fluids and Filtration* BLN-9887 or 520L0463.
For information on biodegradable fluids refer to *Biodegradable Hydraulic Fluids*, 520L0465. See *Fluid and filter maintenance*, page 16 for recommended fluid and filter change intervals.

Temperature range

Temperature limits

Minimum (intermittent, cold start)	-40° C (-40° F)
Continuous ¹	82° C [180° F]
Maximum ²	104° C [220° F]

¹ Hydraulic fluid viscosity must be maintained within the prescribed limits.

² As measured at the hottest point in the system, e.g. drain line.

HYDRAULIC PARAMETERS (continued)

Fluid viscosity

Fluid viscosity limits

Condition	mm ² /s (cSt)	SUS
v min.	9	58
intermittent	6.4	47
continuous	110	500
v max. (cold start)	1000	4700

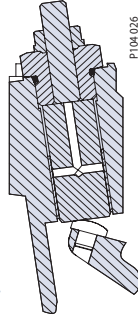
Filtration

Required cleanliness level: ISO 4406 Class 18/13 or better. Refer to Sauer-Danfoss publications *Fluids and Filtration* BLN-9887 or 520L0463 and *Design Guidelines for Selecting and Maintaining the Required Hydraulic Fluid Cleanliness* 520L0465. See *Fluid and filter maintenance*, page 16 for recommended fluid and filter change intervals.

DISPLACEMENT LIMITER

Frame H Series 45 pumps are available with an optional adjustable maximum displacement limiter. The adjustable stop limits the pump's maximum displacement. The displacement change is 6.5 cc/turn [0.40 in³/turn] of the displacement limiter adjustment screw.

Displacement limiter

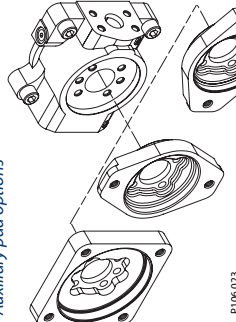


AUXILIARY MOUNTING PADS

Auxiliary mounting pads are available for all radial ported Series 45 pumps. These pads are typically used for mounting auxiliary hydraulic pumps.

Since the auxiliary pad operates under case pressure, you must use an O-ring to seal the auxiliary pump mounting flange to the pad. Oil from the main pump case lubricates the drive coupling. For details refer to *Series 45 Axial Piston Open Circuit Pumps Technical Information* 520L0519.

Auxiliary pad options



INPUT SHAFTS

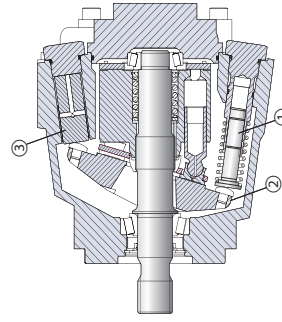
Series 45 H Frame pumps are available with a variety of splined and straight keyed shafts. For information on shafts refer to *Series 45 Axial Piston Open Circuit Pumps Technical Information* 520L0519.

CONTROL OPTIONS

Operation General

The bias piston and spring (1) acts at all times to push the swashplate (2) to maximum angle causing the pump to stroke. The servo piston (3) acts against the bias piston and spring to reduce the swashplate angle causing the pump to destroke. Swashplate angle determines pump outlet flow. The pump control, depending on conditions in the system circuit, sets swashplate angle by metering system pressure to the servo piston.

Cross-section pump



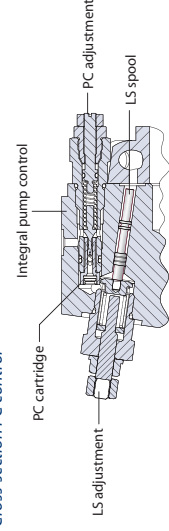
Bias spring and servo piston set swashplate position

PC control

The PC control maintains a constant pressure in the hydraulic circuit as flow varies. The PC control modulates pump flow to maintain system pressure at the PC setting as the PC adjusting screw defines.

When system pressure, acting on the non-spring end of the PC spool, overcomes the force of the PC spring, the spool shifts porting system pressure to the servo piston and the swashplate angle decreases. When system pressure drops below the PC setting, the PC spring shifts the spool in the opposite direction connecting the servo piston to pump case and the swashplate angle increases. The swashplate is maintained at the angle required to keep system pressure at the PC setting.

Cross-section PC control



PC and LS spools shift to port system pressure to servo piston

CONTROL OPTIONS
(continued)

LS control

The LS control matches pump flow with system demand. The LS control senses the flow demand of the system as a pressure drop across the External Control Valve (ECV). As the ECV opens and closes, the pressure delta across the valve changes. When opening, the delta decreases. When closing, the delta increases. The LS control then increases or decreases pump flow to the system until the pressure delta becomes equal to the LS setting as defined by the LS adjustment.

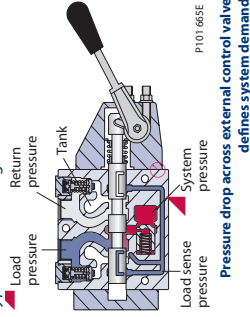
The LS control consists of two spool valves that connect the servo piston either to pump case or system pressure. The PC spool controls the pressure-compensating function of the control as previously described. The LS spool controls the load-sensing function. The PC spool has priority over the LS spool.

Through internal porting, system pressure (upstream of ECV) is applied to the non-spring end of the LS spool, and through hydraulic line connected at port X, LS pressure (downstream of ECV) is applied to the spring end. This arrangement allows the LS spool to act on the delta between system pressure and LS pressure. The LS spring sets the threshold of operation (LS setting).

Because the swashplate is biased to maximum angle, the pump attempts to deliver full flow to the hydraulic system. When the flow being delivered exceeds demand, the pressure delta across the ECV is great enough to overcome spring force and shift the LS spool porting system pressure to the servo piston. The pump de-strokes reducing flow until the delta across the ECV becomes equal to the LS setting. When flow being delivered is less than demand, the delta across the ECV drops below the LS setting and the LS spring shifts the spool connecting the servo piston to pump case. The pump strokes increasing flow until the delta across the ECV becomes equal to the LS setting.

When the external control valve is placed in neutral, it connects the LS signal line to drain. With no LS pressure acting on the non-spring end of the LS spool, the pump adjusts stroke to whatever position necessary to maintain system pressure at the LS setting. The pump is now in standby mode.

Typical load-sensing control valve



REQUIRED TOOLS

The service procedures described in this manual can be performed using common mechanic's hand tools. Special tools, if required are shown. Calibrate pressure gauges frequently to ensure accuracy. Use snubbers to protect gauges.

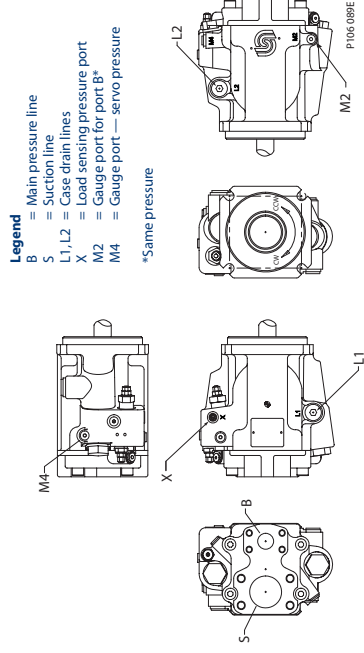
PORT LOCATIONS AND
GAUGE INSTALLATION

The illustration below shows gauge port locations. Recommended pressure gauges and fittings are in the table.

Gauge and port information

Port	Purpose	Range of gauge	Fitting
M2	System pressure	0-300 bar [0-5000 psi]	7/16-20 O-ring fitting
M4	Servo pressure	0-300 bar [0-5000 psi]	7/16-20 O-ring fitting
L1, L2	Case pressure	0-10 bar [0-100 psi]	7/8-14 O-ring fitting
X	LS signal	0-300 bar [0-5000 psi]	7/16-20 O-ring fitting (tee into LS signal line)

Gauge port locations



GENERAL

Follow this procedure when starting-up a new Series 45 installation or when restarting an installation in which the pump has been removed.

▲ Warning

Unintended movement of the machine or mechanism may cause injury to the technician or bystanders. To protect against unintended movement, secure the machine or disable / disconnect the mechanism while servicing.

Prior to installing the pump, inspect for damage incurred during shipping. Make certain all system components (reservoir, hoses, valves, fittings, heat exchanger, etc.) are clean prior to filling with fluid.

START-UP PROCEDURE

● CAUTION

Incorrect shaft alignment may result in damage to drive shaft, bearings, or seal which can cause external oil leakage.

1. Connect the pump to the prime mover. Ensure that pump shaft is properly aligned with the shaft of the prime mover. ●
2. Fill the reservoir with recommended hydraulic fluid. Always filter fluid through a 10 micron filter pouring into the reservoir. Never reuse hydraulic fluid.
3. Fill the main pump housing with clean hydraulic fluid. Pour filtered oil directly into the upper most case drain port.
4. Fill the inlet line leading from the pump to the reservoir. Check the inlet line for properly tightened fittings. Be certain it is free of restrictions and air leaks.
5. To ensure the pump stays filled with oil, install the case drain line in the upper most case drain port.
6. Install a gauge at port M2 to monitor system pressure during start up.

Follow recommendations in the vehicle / machine operator's manual for prime mover start up procedures.

7. While watching the pressure gauge installed at M2, jog the prime mover or run at the lowest possible speed until system pressure builds to normal levels (minimum 11 bar (160 psi)). Once system pressure is established, increase to full operating speed. If system pressure is not maintained, shut down the prime mover, determine cause, and take corrective action. Refer to *Troubleshooting*, page 17.
8. Operate the hydraulic system for at least fifteen minutes under light load conditions.
9. Check and adjust control settings as necessary after installation. Refer to *Adjustments*, page 20.
10. Shut down the prime mover and remove the pressure gauge. Replace plug at port M2.
11. Check the fluid level in the reservoir, add clean filtered fluid if necessary.

The pump is now ready for operation.

RECOMMENDATIONS

To ensure optimum life of Series 45 products, perform regular maintenance of the fluid and filter. Contaminated fluid is the main cause of unit failure. Take care to maintain fluid cleanliness when servicing.

Check the reservoir daily for proper fluid level, the presence of water, and rancid fluid odor. Water in the fluid may be noted by a cloudy or milky appearance or free water in the bottom of the reservoir. Rancid odor indicates the fluid has been exposed to excessive heat. Change the fluid immediately if these conditions occur. Correct the problem immediately.

Change the fluid and filter per the vehicle / machine manufacturer's recommendations or at these intervals:

Fluid and filter change interval	
Reservoir type	Maximum change interval
Sealed	2000 hours
Breather	500 hours

Change the fluid more frequently if it becomes contaminated with foreign matter (dirt, water, grease, etc.) or if the fluid is subjected to temperature levels greater than the recommended maximum.

Dispose of used hydraulic fluid properly. Never reuse hydraulic fluid.

Change filters whenever the fluid is changed or when the filter indicator shows that it is necessary to change the filter. Replace all fluid lost during filter change.

EXCESSIVE NOISE AND / OR VIBRATION

Item	Description	Action
Check fluid level in reservoir.	Insufficient hydraulic fluid causes cavitation.	Fill the reservoir to proper level.
Check for air in system.	Air in system causes noisy, erratic control.	Purge air and tighten fittings. Check inlet for leaks.
Check pump inlet pressure / vacuum.	Improper inlet conditions cause erratic behavior and low output flow.	Correct pump inlet pressure / vacuum conditions. Refer to <i>Hydraulic parameters</i> , page 10.
Inspect shaft couplings.	A loose or incorrect shaft coupling causes excessive noise and / or vibration.	Repair or replace coupling and ensure that correct coupling is used.
Check shaft alignment.	Misaligned shafts create excessive noise and / or vibration.	Correct shaft misalignment.
Hydraulic fluid viscosity above acceptable limits.	Hydraulic fluid viscosity above acceptable limits or low fluid temperature will not allow the pump to fill or control to operate properly.	Allow system to warm up before operating, or use fluid with the appropriate viscosity grade for expected operating temperatures. See <i>Hydraulic Fluids, Series 45 Technical Information Manual, 520L0519</i> .

ACTUATOR RESPONSE IS SLUGGISH

Item	Description	Action
Check external system relief valve setting.	Low external relief valve setting slows down system.	Adjust external relief valve setting following manufacturer's recommendations. External relief setting must be above PC setting to operate properly.
Check PC and LS control setting.	Low PC setting prevents the pump from achieving full stroke. Low LS setting limits output flow.	Adjust PC and LS setting. Refer to <i>Adjustments</i> , page 21.
Check LS control signal pressures.	Incorrect LS signal will not allow pump to operate correctly.	Inspect system to ensure that proper LS signal transmit to pump.
Internal system leaks.	Worn internal parts don't allow the pump to operate properly.	Refer to Authorized Service Center for required repair.
Hydraulic fluid viscosity above acceptable limits.	Hydraulic fluid viscosity above acceptable limits or low fluid temperature will not allow the pump to fill or control to operate properly.	Allow system to warm up before operation or use fluid with the appropriate viscosity grade for expected operating temperatures. See <i>Hydraulic Fluids, Series 45 Technical Information Manual, 520L0519</i> .
Check external system valving.	Malfunctioning valving may not allow system to respond properly.	Repair or replace system valving as required.
Check pump case pressure.	High case pressure causes the system to be sluggish.	Correct case drain line restrictions.
Check pump inlet pressure / vacuum.	High inlet vacuum causes low output flow.	Correct inlet pressure conditions.

SYSTEM OPERATING HOT

Item	Description	Action
Check fluid level in reservoir.	Insufficient volume of hydraulic fluid will not meet cooling demands of system.	Fill reservoir to proper level. Verify proper size of reservoir.
Inspect heat exchanger. Check air flow and input air temperature for the heat exchanger.	Insufficient air flow, high input air temperature, or undersized heat exchangers will not meet cooling demands of the system.	Clean, repair, or replace heat exchanger as required. Verify proper size of heat exchanger.
Check external system relief valve setting.	Fluid passing through relief valve adds heat to system.	Adjust external system relief valve setting following manufacturer's recommendations. External relief valve setting must be above PC setting for proper operation.
Check pump inlet pressure / vacuum.	High inlet vacuum adds heat to system.	Correct inlet pressure / vacuum conditions.

LOW PUMP OUTPUT FLOW

Item	Description	Action
Check fluid level in reservoir.	Insufficient hydraulic fluid will limit output flow and cause internal damage to pump.	Fill the reservoir to proper level.
Hydraulic fluid viscosity above acceptable limits.	Fluid viscosity above acceptable limits or low fluid temperature will not allow the pump to fill or control to operate properly.	Allow system to warm up before operating, or use fluid with the appropriate viscosity grade for expected operating temperatures. See <i>Hydraulic Fluids, Series 45 Technical Information Manual, 520L0519</i> .
Check external system relief valve setting.	External relief valve set below PC setting causes low output flow.	Adjust external relief valve following manufacturer's recommendation. External relief valve setting must be above PC setting to operate properly.
Check PC and LS control setting.	Low PC setting prevents the pump from achieving full stroke.	Adjust PC and LS setting. Refer to <i>Adjustment</i> , page 20.
Check pump inlet pressure / vacuum.	High inlet vacuum causes low output flow.	Correct inlet pressure conditions.
Check input speed.	Low input speed's decrease flow.	Adjust input speed.
Check pump rotation.	Incorrect rotational configuration causes low flow.	Use pump with appropriate rotational configuration.

PRESSURE OR FLOW INSTABILITY

Item	Description	Action
Check for air in system.	Air in system causes erratic operation.	Activate PC allowing system to bleed air. Check inlet line for leaks and eliminate source of air ingestion.
Check control spools.	Sticking control spools cause erratic operation.	Inspect spools for free movement in bore. Clean or replace.

**PRESSURE OR FLOW
INSTABILITY (continued)**

Item	Description	Action
Check LS setting.	Low LS setting may cause instability.	Adjust LS setting to proper level. See <i>Adjustments</i> , page 20.
Check LS signal line.	Blocked LS signal line interferes with proper LS operation.	Remove blockage.
Check external relief valve and PC setting.	Insufficient pressure differential between PC setting and external relief valve.	Adjust external relief valve or PC control settings to appropriate level. Relief valve setting must be above PC setting to operate properly.
Check external relief valve.	Chattering external relief valve may cause unstable feedback to pump control.	Adjust or replace relief valve.

**SYSTEM PRESSURE NOT
REACHING PC SETTING**

Item	Description	Action
Check PC control setting.	System pressure will not rise above PC setting.	Adjust PC to appropriate setting. Refer to <i>Adjustments</i> , page 20.
Check external relief valve.	External relief valve setting below PC setting prevents pressure compensation.	Adjust external relief valve according to manufacturer's recommendations. External relief valve must be set above PC setting to operate properly.
Inspect PC control spring.	Broken, damaged, or missing spring will cause erratic operation.	Replace the spring as required.
Inspect PC spool for wear.	Wear of PC spool causes internal leakage in the control.	Replace the spool as required.
Inspect PC spool for proper orientation.	Improper orientation results in poor operation.	Correct orientation of spool.
Check PC control for contamination.	Contamination may interfere with movement of the PC spool.	Clean PC control components, take appropriate action to eliminate contamination.

HIGH INLET VACUUM

- ⚠ **Caution**
High inlet vacuum causes cavitation which can damage internal pump components.

Item	Description	Action
Check fluid temperature.	Low temperature increases viscosity. High fluid viscosity causes high inlet vacuum.	Allow system to warm up before operating.
Inspect inlet screen.	Blocked or restricted inlet screen causes high inlet vacuum.	Clean screen / remove blockage.
Check inlet piping.	Too many fittings, bends, or long piping causes high inlet vacuum.	Eliminate fittings to make path more direct.
Hydraulic fluid viscosity above acceptable limits.	High fluid viscosity causes high inlet vacuum.	Select fluid with appropriate viscosity for expected operating temperature. See <i>Hydraulic fluids</i> , <i>Series 45 Technical Information Manual</i> , 520L0519 .

**PC SECOND STAGE
CONTROL**

PC second stage setting is indicated in the pump model code. Refer to the *Series 45 Open Circuit Axial Piston Pumps Technical Information Manual* **520L0519**, for more information.

⚠ Warning

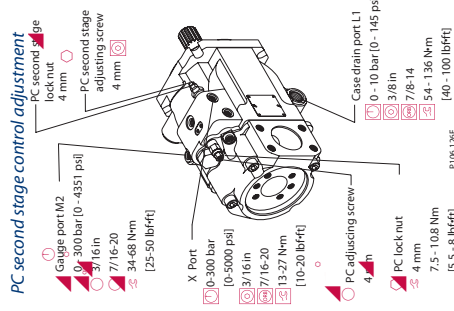
Escaping hydraulic fluid under pressure can have sufficient force to penetrate your skin causing serious injury and/or infection. Relieve pressure in the system before removing hoses, fittings, gauges, or components.

Unintended movement of the machine or mechanism may cause injury to the technician or bystanders.

To protect against unintended movement, secure the machine or disable / disconnect the mechanism while servicing.

⚠ Caution

Contamination can damage internal components and void the manufacturer's warranty. Take precautions to ensure system cleanliness when removing and reinstalling system lines.



1. Install a pilot hose (6mm [0.25 in] diameter minimum) at port X, connecting to the reservoir to drain the remote PC port. **⚠**

Failure to drain port X (spring cavity) to reservoir may cause additional back pressure on the PC spring, resulting in pressure settings above the desired specification. It is recommended that this procedure be used on all Series 45, 57cc pumps, however it is particularly vital to 1999 and newer units due to hardware changes associated with the PC cartridge.

2. Start the prime mover and run at normal speed. While securing the second stage adjustment screw, loosen the seal lock nut. Turn the 2nd stage adjustment screw until the gauge at port M2 reads 15 bar (220 psi). Clockwise rotation increases pressure, counterclockwise rotation will decrease pressure.

3. While holding the position of the second stage adjustment screw, torque the seal locknut to 23 N·m (17 lbf·ft).

4. Shut down the prime mover. Disconnect the pilot hose installed at port X and reinstall the plug.

PC CONTROL

PC setting is indicated in the pump model code. Refer to the *Series 45 Open Circuit Axial Piston Pumps Technical Information Manual 520L0519*, for more information.

Before performing adjustments, read page 14, *Pressure measurement*.

▲ Warning

Escaping hydraulic fluid under pressure can have sufficient force to penetrate your skin causing serious injury and/or infection. Relieve pressure in the system before removing hoses, fittings, gauges, or components.

Unintended movement of the machine or mechanism may cause injury to the technician or bystanders. To protect against unintended movement, secure the machine or disable / disconnect the mechanism while servicing.

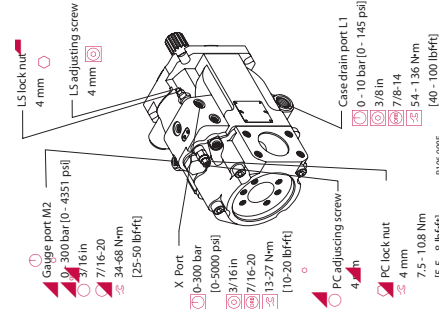
PC control adjustment

1. Start the prime mover and allow fluid to reach normal operating temperature. Operate a hydraulic function to its full extension, loading the pump at maximum pressure and zero flow.
2. While securing the PC adjusting screw, loosen the PC lock nut and turn the PC adjusting screw until the desired setting is indicated on the pressure gauge at port M2¹. Clockwise rotation increases pressure, counterclockwise rotation decreases pressure; approximate gain 57 bar [825 psi] per turn.

If the pressure does not increase, an external system relief valve may require adjustment. External system relief valve must be set above the PC setting for proper operation.

3. While holding the position of the PC adjusting screw, torque the PC lock nut to 7.5 - 10.8 N·m [5.5 - 8 lbf·ft].
4. Stop the prime mover, remove the pressure gauges, and return the system to its normal operating configuration.

⚠ Caution
Contamination can damage internal components and void the manufacturer's warranty. Take precautions to ensure system cleanliness when removing and reinstalling system lines.



LS CONTROL

The LS setting is indicated in the pump model code. Refer to the *Series 45 Open Circuit Axial Piston Pumps Technical Information Manual 520L0519*, for more information.

Before performing adjustments, read page 15, *Pressure measurement*.

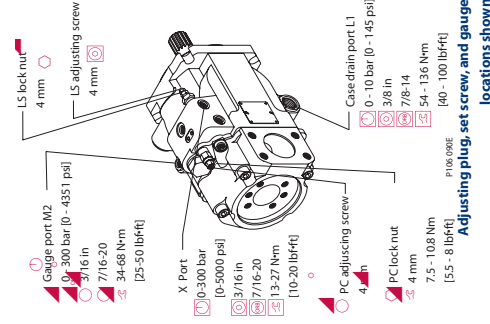
▲ Warning

Escaping hydraulic fluid under pressure can have sufficient force to penetrate your skin causing serious injury and/or infection. Relieve pressure in the system before removing hoses, fittings, gauges, or components.

Unintended movement of the machine or mechanism may cause injury to the technician or bystanders. To protect against unintended movement, secure the machine or disable / disconnect the mechanism while servicing.

LS control adjustment

1. Install a pressure gauge in port M2 to measure system pressure. Install a pressure gauge in drain port L1 to measure case pressure. Tee-in a gauge to the LS / remote PC signal line (port X). ▲ ⚠
2. Start the prime mover and allow fluid to reach normal operating temperature. Slowly operate a hydraulic function that will demand approximately half flow from the pump, but keep system pressure below the PC set point.
3. Loosen the LS lock nut. While watching the pressure gauges, turn the LS adjusting screw until the desired pressure differential between port M2 and port X is achieved¹. Clockwise rotation increases the setting, counterclockwise rotation will decrease it; approximate gain = 18 bar [260 psi] per turn.
4. While holding the position of the LS adjusting screw, torque the LS lock nut to 7.5 - 10.8 N·m [5.5-8 lbf·ft].
5. Operate a hydraulic function to its full extension loading the pump at maximum pressure and zero flow.
6. Loosen the PC lock nut and turn the PC adjusting screw until the desired setting is indicated on the pressure gauge at port M2². Clockwise rotation increases pressure, counterclockwise rotation decreases it; approximate gain = 57 bar [825 psi] per turn.
7. While holding the position of the PC adjusting screw, torque the PC lock nut to 7.5 - 10.8 N·m [5.5-8 lbf·ft].
8. Stop the prime mover, remove the pressure gauges, and return the system to its normal operating configuration.



⚠ Caution
Contamination can damage internal components and void the manufacturer's warranty. Take precautions to ensure system cleanliness when removing and reinstalling system lines.

¹ P C setting is referenced to case pressure. Subtract case pressure from system pressure to compute the actual setting.

² The LS setting is a differential pressure. Subtract pilot pressure at port X from system pressure at port M2 to compute the actual setting.

³ PC setting is referenced to case pressure. Subtract case pressure from system pressure to compute the actual setting.

SHAFT SEAL REPLACEMENT

The Series 45 open circuit variable pumps use a lip-type shaft seal. You can replace this seal without major disassembly of the unit. Replacing the shaft seal requires removing the pump from the machine.

Removal

1. Using the appropriate snap-ring pliers, remove the retaining ring (K010) from the housing.

- ⚠ **Caution**
Don't damage the pump housing or shaft.

2. Puncture the face of the seal (K020) with a packing hook or use a slide-hammer type puller to remove the seal.

3. Remove the shaft seal from the bore in the pump housing and discard.

Installation

4. Inspect the pump housing and new seal for damage. Inspect the sealing area on the shaft for rust, wear, or contamination. Polish the sealing area on the shaft if necessary.

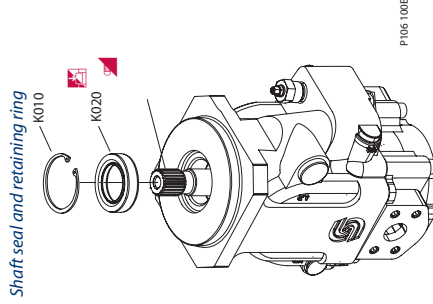
5. Lubricate the lip of the new shaft seal with clean hydraulic fluid. Place a protective sleeve over the shaft end to prevent damage to the seal during installation.

- ⚠ **Caution**
Premature bearing failure can result if the shaft seal contacts the shaft bearing. Press the seal into the housing only far enough to clear the retaining ring groove.

6. Keeping the seal perpendicular to the shaft, press the new seal into the housing just far enough to clear the retaining ring groove.

7. Using the appropriate snap ring pliers, install the seal retaining ring.

8. Remove the installation sleeve.



AUXILIARY PADS

You may install auxiliary mounting pads on pumps equipped with through-drive radial ported end caps. Follow these steps to either remove, replace, or exchange auxiliary mounting pads.

Removal

1. Remove the screws (J130), retaining the cover plate (J110) or auxiliary pump (not shown). Remove the shipping cover or auxiliary pump and its seal (J120).
2. Remove the drive coupling (J140) if present.
3. Remove the 4 screws (J100) retaining the pad adapter (J080) to the endcap. Discard the pad adapter O-ring (J095) if present.

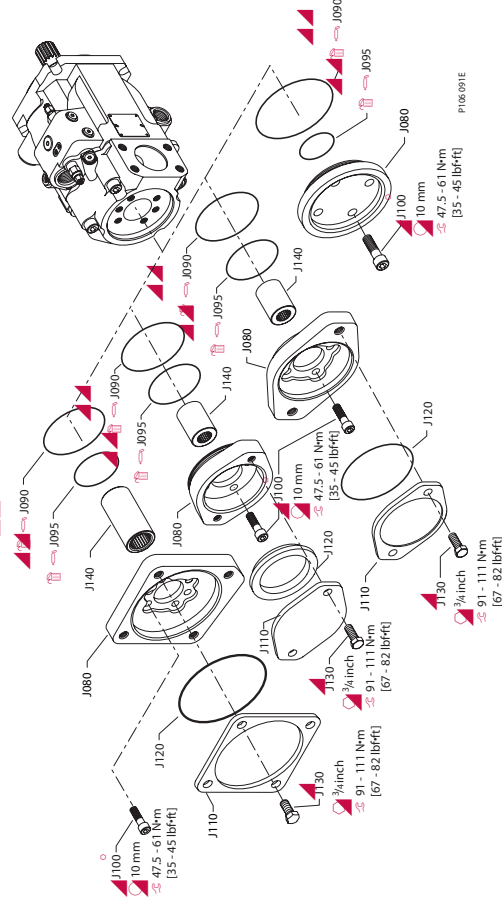
Installation

4. Lubricate new O-ring (J095) with petroleum jelly. Install the pad adapter to the endcap.
5. Install the 4 screws (J100) and torque to 47.5 - 61 N·m [35 - 45 lbf·ft].
6. Install the drive coupling (J140) if present.
7. Install shipping cover or auxiliary pump with seal (J120).

- ⚠ **Caution**
Shipping cover is intended only to retain coupling during shipment and storage. Do not operate pump with coupling and shipping cover installed.

8. Install the screws (J130) and torque to 94 - 111 N·m [67 - 82 lbf·ft] if you have an auxiliary A pad, install the screws (J131) and torque to 37 - 50 N·m [27 - 37 lbf·ft].

Auxiliary mounting pads

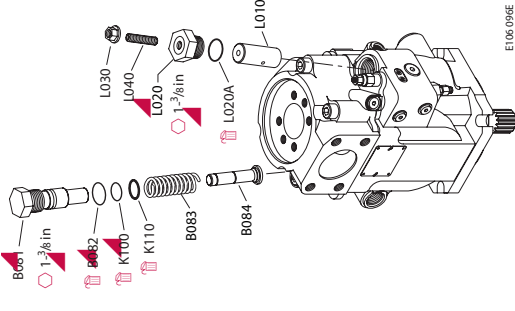


BIAS PISTON, SERVO PISTON, AND OPTIONAL DISPLACEMENT LIMITER

Disassembly

1. Remove the bias guide plug (B081) using a 1-3/8 inch hex wrench. Also, remove the bias spring (B083), and piston (B084). Discard the O-rings (B082, K100) and backup ring (K110).
2. Remove the servo piston plug (L020) and servo piston (L010) using a 1-3/8 inch hex wrench. Discard the O-ring (L020A).
3. Take note of the orientation of the servo piston. The end of the piston with the hole should be facing upward.

Remove servo and bias pistons



PRESSURE COMPENSATOR VALVE

Old style

4. Remove the PC plug (C120) from the pump using a 3/16 inch hex wrench. Discard the O-ring (C120A).

5. Remove the PC cartridge using an 11/16 inch hex wrench. Discard the O-rings (D016, K080) and backup ring (K090).

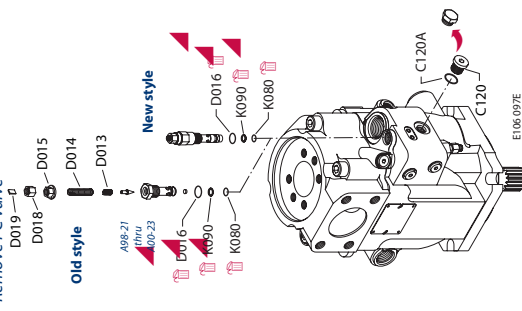
6. If necessary, loosen the locknuts (D015, D018) on the set screw (D014).

New style

7. Remove the PC plug (C120) from the pump using a 9/16 inch hex wrench. Discard the O-ring (C120A)

8. The new style is a one-piece cartridge. Remove the PC cartridge with a 1 1/16 inch hex wrench. Discard the O-rings (D016, K080) and the backup ring (K090).

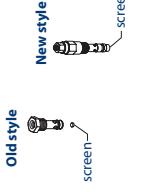
Remove PC valve



PRESSURE COMPENSATOR VALVE (continued)

9. Inspect the screen in the end of the valve for contamination. It is important that the valve is not plugged.

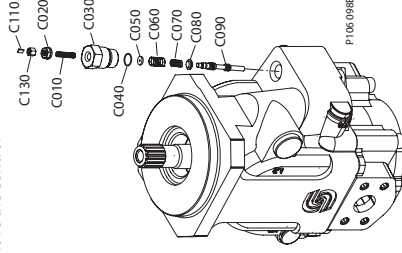
Inspect the PC valve



LOAD SPRING CONTROL

Unscrew the plug (C030) using a 7/8 inch hex wrench. Discard the O-ring (C040). If the springs (C070, C060) remain in the bore, remove them along with the spring seat (C080) and the PC spool (C090) with a magnet.

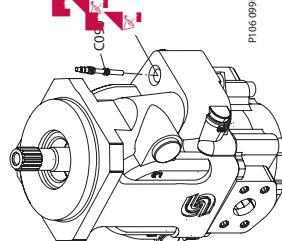
Remove the control



CONTROL

Check the spool for nicks and scratches. Make sure the PC spool orifice is not contaminated or plugged.

Inspect the control spool and orifice



SERVO AND BIAS PISTONS AND DISPLACEMENT L

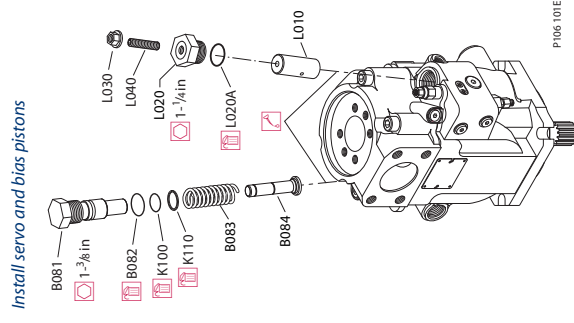
Reassembly

1. Lubricate all sides of the servo piston (L010) and its respective bore liberally with hydraulic oil. Reinstall the servo piston with the 'hole end' up. Reinstall the displacement limiter plug (L020) and tighten with a 1 3/4 inch socket to 175-245 N•m [120-170 lbf•ft].

2. Install the set screw (L040) and use a 19 mm hex wrench to torque the adjustment seal/nut (L030) at 78 to 95 N•m [58 to 70 lbf•ft].

3. Lubricate the bias piston (B084) and its respective bore with a liberal coating of hydraulic oil. Reinstall the bias plug (B081) and spring (B083) with new O-rings. Use a 1 3/8 inch socket to tighten to 175-245 N•m [120-170 lbf•ft].

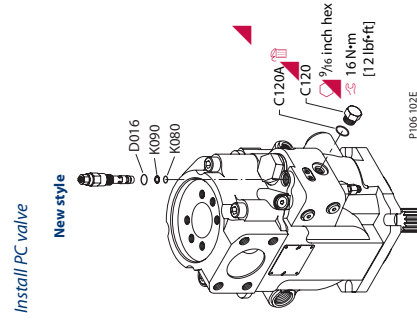
It is extremely important that the bias piston plug (B081) be correctly torqued, as it may back out at lower torques.



PRESSURE COMPENSATOR VALVE

New style

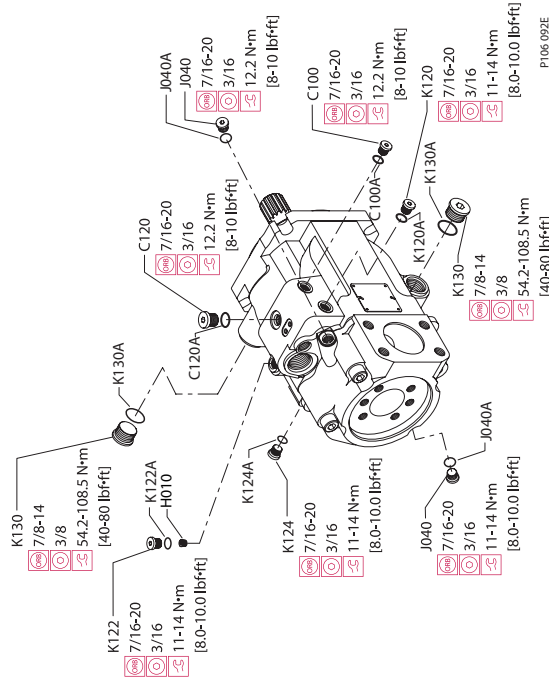
4. Using a $\frac{1}{8}$ " inch hex wrench, install short hex plug (C1 20) with a new O-ring (C1 20A). Torque this plug to 11-14 N·m [8-10 lbf·ft]. After installing the plug, install the new PC cartridge. Torque to 27-47 N·m [25-35 lbf·ft] with an $\frac{1}{16}$ " inch hex wrench. Reset your pressure compensating setting following the [Series 45 Service Manual, BLN-10129](#) as these do not come preset. The new gain for the PC setting is 825 psi/turn.



If any plugs or fittings are removed from the unit during service, install and torque as indicated here. This drawing is a composite. Your configuration may differ. Illustration shows the appropriate wrench size and torque for most plugs and fittings:

PLUG AND FITTING SIZES AND TORQUES

Plug locations, sizes, and torques





OUR PRODUCTS

Hydrostatic transmissions
Hydraulic power steering
Electric power steering
Electrohydraulic power steering
Closed and open circuit axial piston pumps and motors
Gear pumps and motors
Bent axis motors
Orbital motors
Transit mixer drives
Planetary compact gears
Proportional valves
Directional spool valves
Cartridge valves
Hydraulic integrated circuits
Hydrostatic transaxles
Integrated systems
Fan drive systems
Electrohydraulics
Microcontrollers and software
Electric motors and inverters
Joysticks and control handles
Displays
Sensors

Sauer-Danfoss Mobile Power and Control Systems – Market Leaders Worldwide

Sauer-Danfoss is a comprehensive supplier providing complete systems to the global mobile market.

Sauer-Danfoss serves markets such as agriculture, construction, road building, material handling, municipal, forestry, turf care, and many others.

We offer our customers optimum solutions for their needs and develop new products and systems in close cooperation and partnership with them.

Sauer-Danfoss specializes in integrating a full range of system components to provide vehicle designers with the most advanced total system design.

Sauer-Danfoss provides comprehensive worldwide service for its products through an extensive network of Authorized Service Centers strategically located in all parts of the world.

Sauer-Danfoss (US) Company
2800 East 13th Street
Ames, IA 50010, USA
Phone: +1 515 239-6000, Fax: +1 515 239 6618

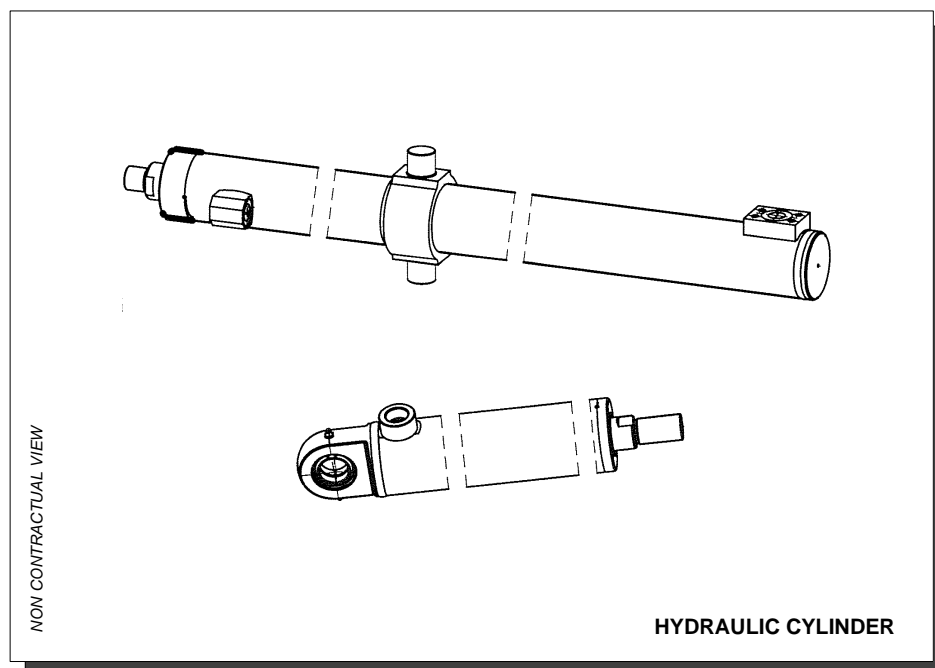
Sauer-Danfoss GmbH & Co. OHG
Postfach 2460, D-24531 Neumünster
Krokanp 35, D-24539 Neumünster, Germany
Phone: +49 4321 871-0, Fax: +49 4321 871 122

Sauer-Danfoss ApS
DK-6430 Nordborg, Denmark
Phone: +45 7488 4444, Fax: +45 7488 4400

www.sauer-danfoss.com

5.26 HYDRAULIC CYLINDERS (NEUMEISTER)

Location	ECL code	Reference	Seal kit
Extracting mechanism	1-10-654-70	D.100 x 56 Stroke 3200	1-10-030-08
Bath grab : Shovel (1st lifting)	1-10-578-03	D.80 x 56 Stroke 2600	1-10-548-48
Bath grab : Shovel (2nd lifting)	1-10-578-07	D.80 x 56 Stroke 1900	1-10-548-48
Bath Pipe	1-10-922-63	D.80 x 56 Stroke 4250	1-10-548-48
Bath Pipe	1-10-942-77	D.80 x 56 Stroke 400	1-10-548-48





PROCEDURE FOR DISMANTLING AND REASSEMBLING THE ELEMENTS OF A HYDRAULIC CYLINDER

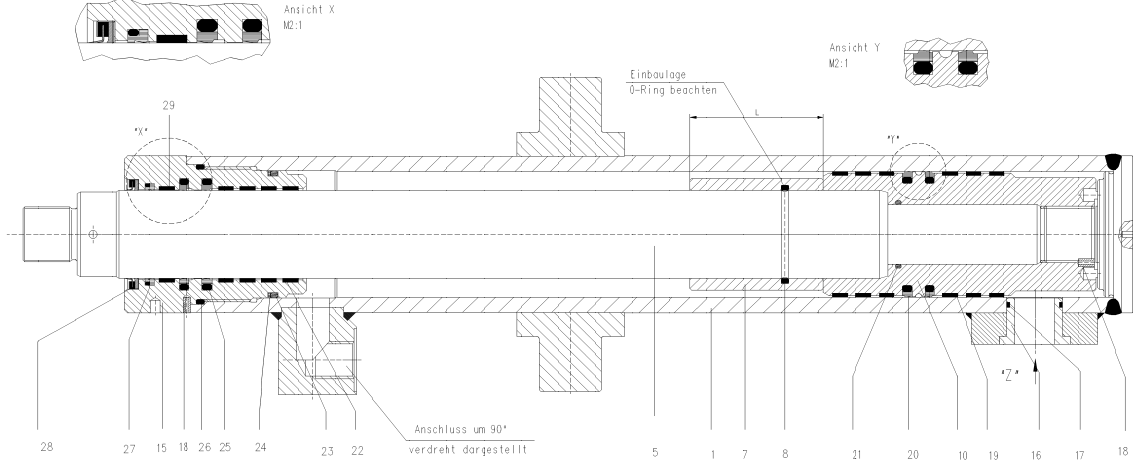
E.g.: replacing guide rings and gaskets

!! ATTENTION

- > The gaskets are sensitive to contamination.
- > Work in a very clean workshop and take all the necessary cleaning precautions.
- > If an orifice is disconnected from the hydraulic circuit it must be hermetically sealed to avoid the entrance of pollution.
- > When using compressed air, pay attention to the effects of compression and expansion. Do not use excessively high pressure.
- > If compressed air is injected into the chambers of the cylinder, make sure it passes through a suitable air/water separation and filtering system.
- > Do not apply temperature variations to cylinders with no pressure relief device which contain oil and have their orifices blocked.
Risk of overpressure and explosion!!
- > To make the seals more flexibility, they can be placed in previously heated water or oil (100°C max).
Never heat them in a furnace.



Cylinder cross-section analogy





REMOVAL:

- > Position the cylinder horizontally with the orifices facing downwards, the rod retracted and release the oil contained inside the cylinder
- > Turn the cylinder so that the orifices face upwards, make the necessary connections and push it out using compressed air (filtered!!) by sections of 20 cm, making sure to support the weight of the rod in line with the cylinder body
- > Make sure that the front and rear chambers are depressurised and disconnected from the compressed-air source
- > Block the orifices
- > Remove the safety pin from the guide head (Pos. 18) using a drill.
Take care *not to drill too deep!*
For a cylinder:
Diam. 80 = pin with a diameter of 5 mm
Diam. 100 = pin with a diameter of 6 mm
It is preferable to drill using a bit with a diameter 1 mm smaller. It is often possible to remove the remaining metal crown with the help of a sharp tool or else to drill to the nominal diameter.
- > Unscrew the guide head (Pos. 15) from the cylinder body using a pin wrench or a chain pipe wrench according to the external design of the guide head.
- > Completely remove the rod and its piston (Pos. 5 and 10), leaving the guide head on the rod
- > Take special care to ensure that no pollution can enter the cylinder tube
- > Position the rod horizontally
- > Remove the guide head from the piston rod



- > Remove the safety pin (Pos. 18) from the piston using a drill.
Take care *not to drill too deep!*
It is preferable to drill using a bit with a diameter 1 mm smaller. It is often possible to remove the remaining metal crown with the help of a sharp tool or else to drill to the nominal diameter.
- > Unscrew the piston (Pos. 10) from the rod
- > Remove the guide rings and seals




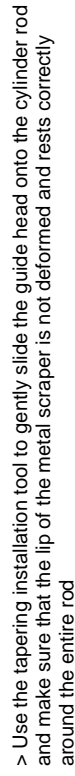
REINSTALLATION:

- > Install the rod carefully to avoid damaging its surface
- > Check that it does not have any prongs or cuts
- > If necessary, reinstall the stroke-limiting spacer with the circlip. Begin by placing the circlip and then slide the spacer onto the rod
- > Use a suitable widening cone to slightly widen the diameter of the seals and be able to install them more easily on the piston.
If necessary, heat the widening cone beforehand, but never to more than 100°C (e.g. boiling water)
- > Install the seals (pay attention to the direction) and guide rings on the piston and lubricate the seals using a mix of 50% acid-free grease and 50% hydraulic oil HLP46 or 68. Make sure to use pollution-free lubricants.
- > Screw the piston back onto the rod and tighten it to match the two halves of the pin holes. Insert the safety pin and bend it down using a punch and a hammer
- > Gently place the female cone for reinstalling the seals on the piston in order to retighten the seals, paying attention to the direction
- > Carefully clean the inside of the cylinder body using a perfectly clean cloth, and lubricate it slightly with perfectly clean hydraulic oil
- > Slide the rod horizontally into the cylinder body, making sure not to damage the seals

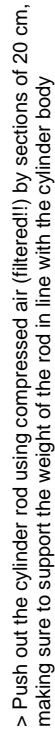




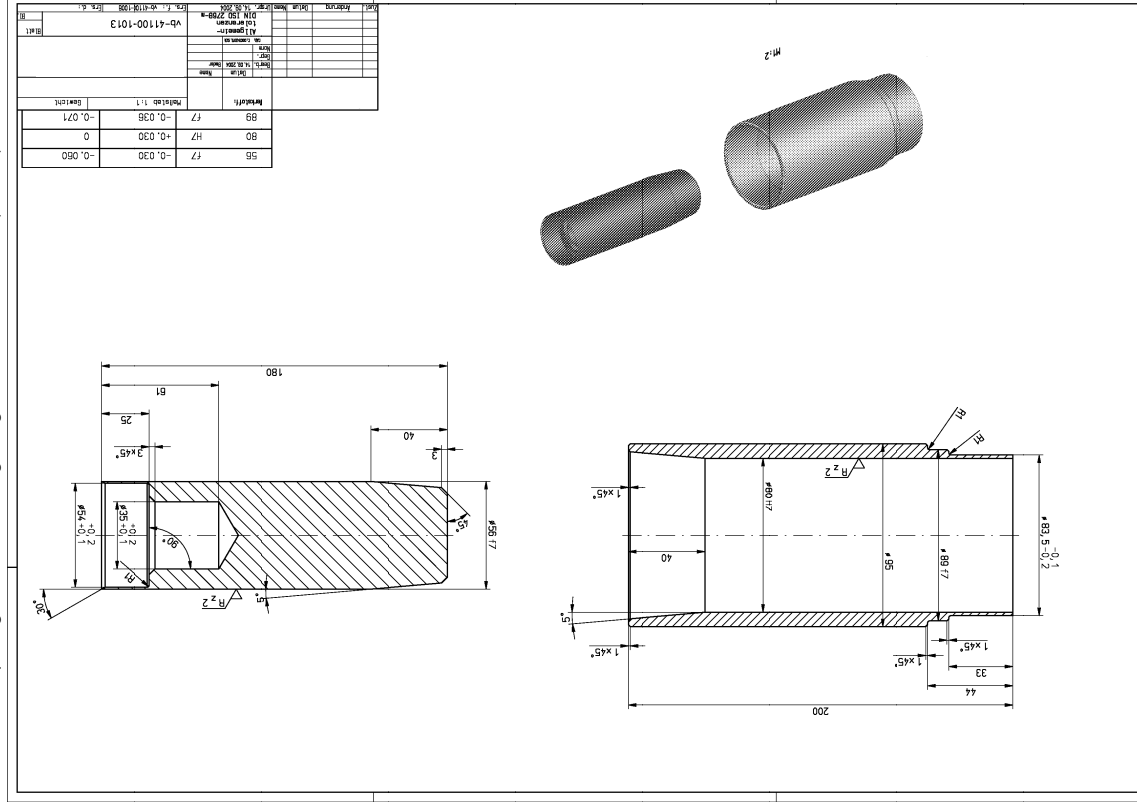
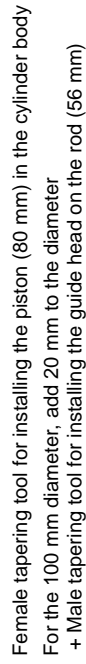
- > Lubricate the seals and guide rings using a mix of 50% acid-free grease and 50% hydraulic oil HLP46 or 68. Make sure to use pollution-free lubricants
 - > Gently insert the tapering installation pin (with the same diameter as the rod) into the guide head so that the seals fit perfectly into the grooves
- 



- > Reinstall the guide head and tighten it to match the two halves of the pin holes. Insert the safety pin and bend it down using a punch and a hammer

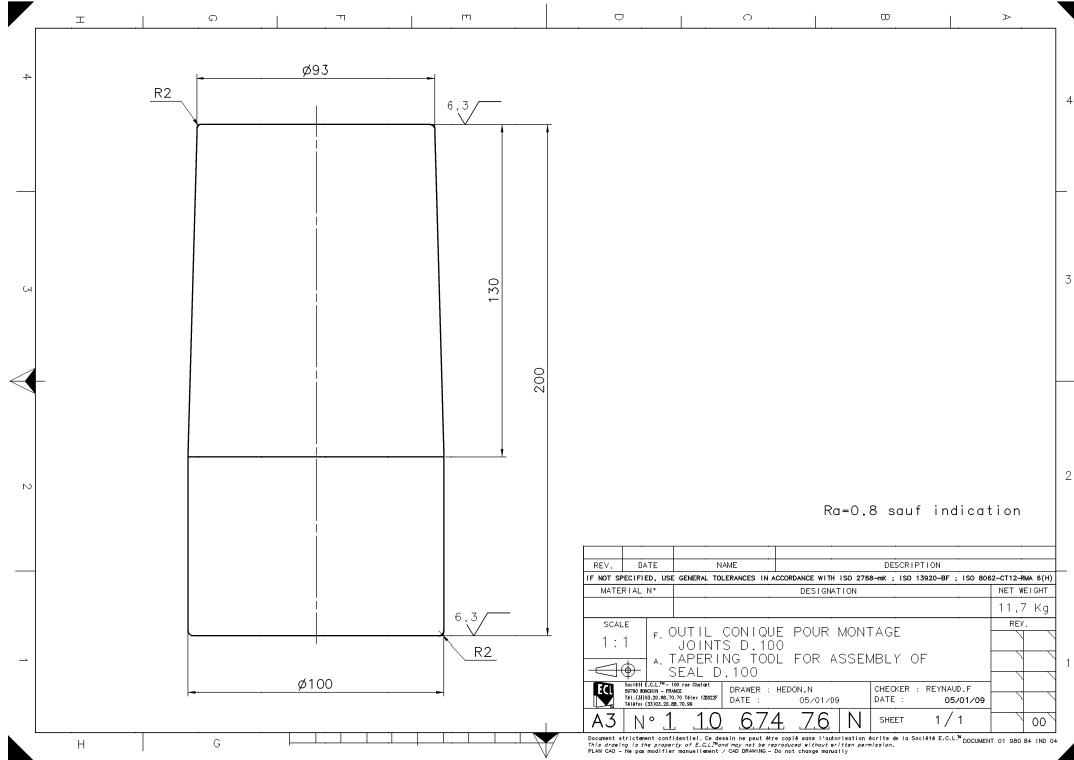


- > Equip the cylinder with the necessary blocks and test its pressure to make sure there are no leaks between chambers. Consult the nominal pressure and test pressure indicated in the cylinder plans
- > Hermetically seal the orifices and protect the rod against rust and dust

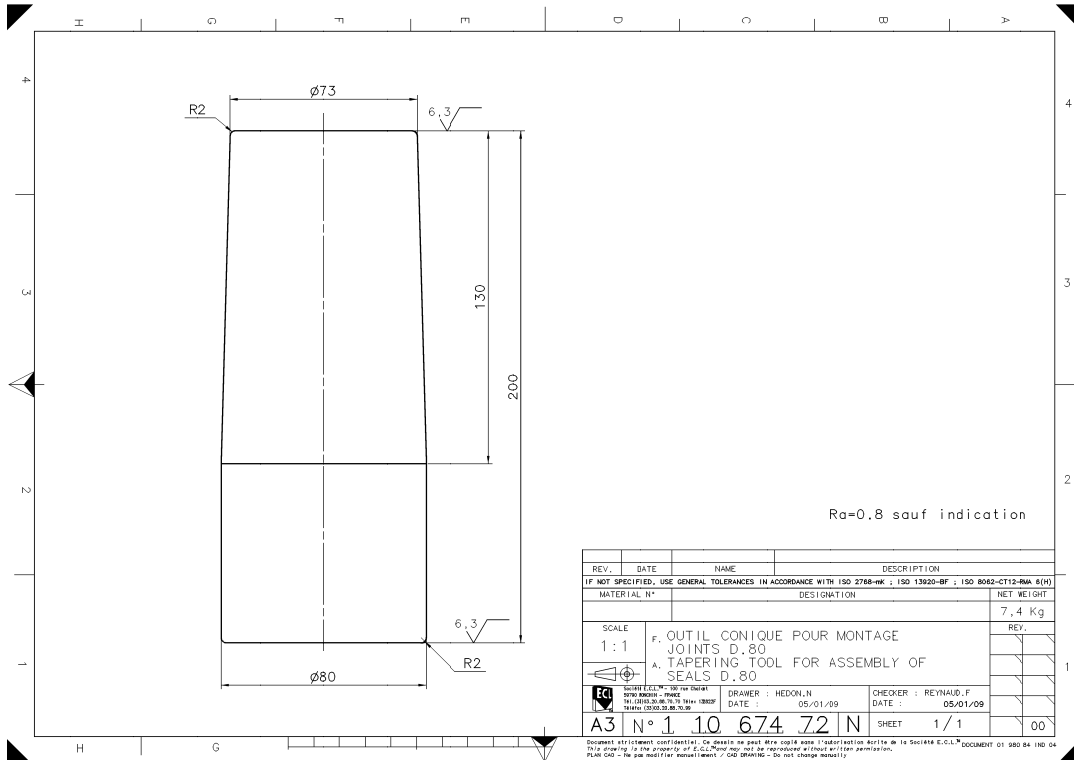




Male tapering tool for widening the piston seals (100 mm)

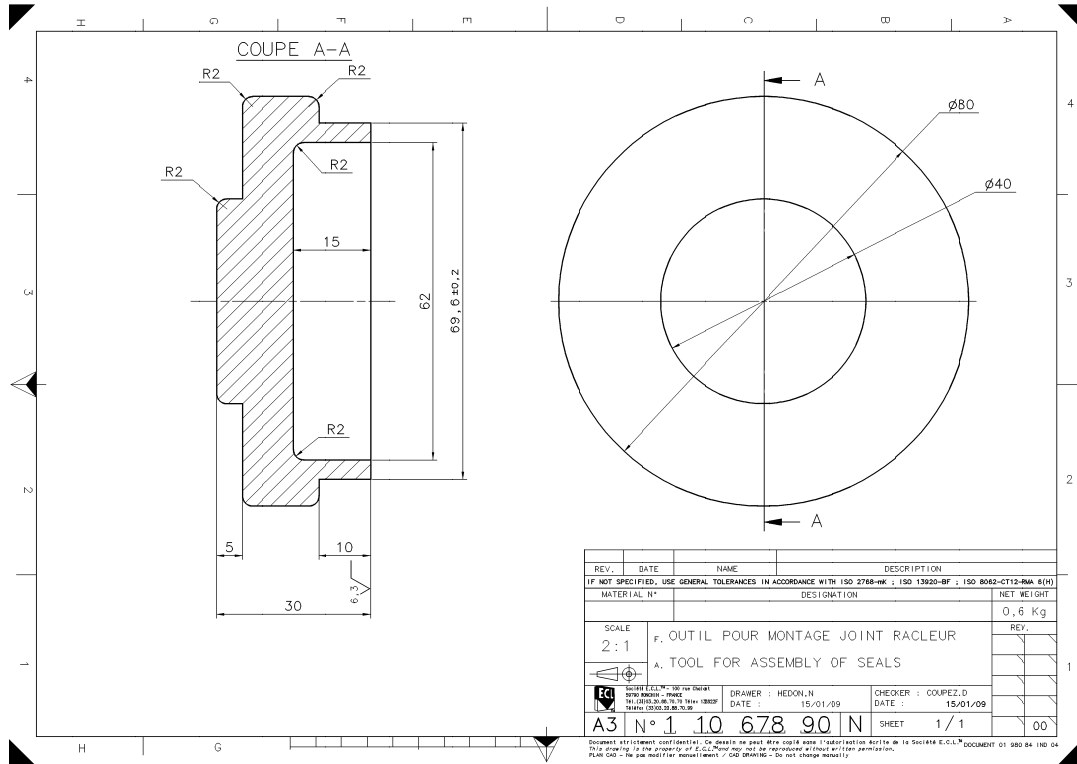


Male tapering tool for widening the piston seals (80 mm)





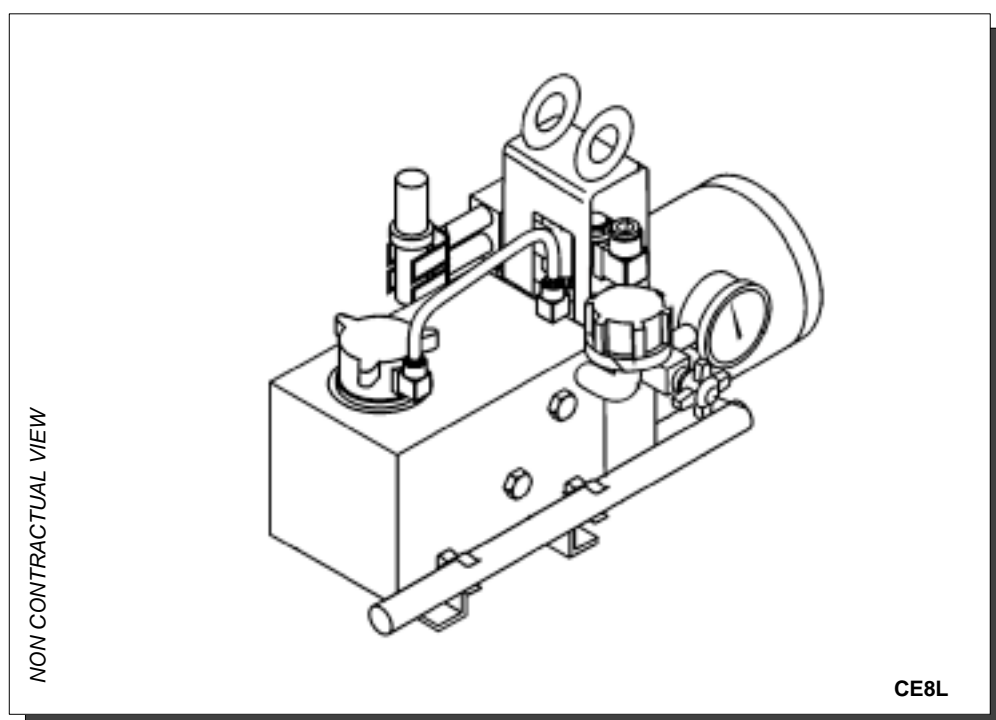
Tool for installing the metal scraper



5.27 HYDRAULIC POWER UNIT CE08L

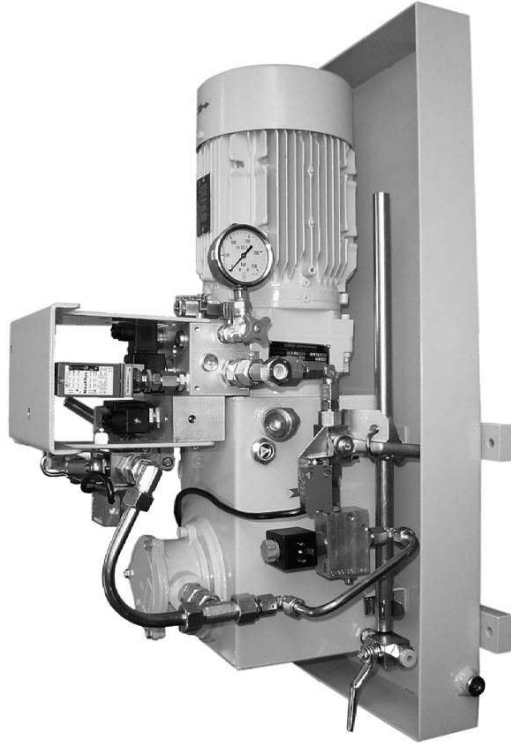
1. DESCRIPTION

Location	ECL code	Reference
Tapping trolley hoist	1-10-902-05	CE8L-16-OP1-OP2-OP6



Hydraulic power unit CE8L

Installation and maintenance



SUMMARY

Chapter	Title	Page
NOTES AND SYMBOLS		
1	PRESENTATION	3
1-1	Use	4
1-2	General characteristics	4
1-3	Operating conditions	4
1-4	Recommendations	4
2	OPERATION	5
2-1	Flow diagram	5
2-2	Principle	5
2-3	Options	6
3	CHARACTERISTICS	8
3-1	Designation	8
3-2	Hydraulic characteristics	9
3-3	Electrical characteristics	9
4	POSITIONING	9
4-1	Standard conditions of delivery	9
4-2	Installation	9
4-3	Fastening	9
4-4	Protection	9
5	CONNECTION	10
5-1	Electrical connections	10
5-2	Hydraulic connections	11
6	START-UP	12
6-1	Mineral oil	12
6-2	After a long term storage	12
6-3	Filling	12
6-4	Opening the brakes without voltage	12
6-5	Pressure limit valves setting	12
7	MAINTENANCE	13
7-1	Preventing control	13
7-2	Oil replacement	13
8	FAULT DIAGNOSIS	14
	Trouble shooting guide	15
	Dimensions	16
	Flow diagram	17
	Components of hydraulic power unit	18


Disc brake - Power unit CE8L

Installation and maintenance


NOTES AND SYMBOLS

According to EC regulations, we use, facing some paragraphs, symbols defining hazards and informing the user about the consequences of not following the instructions of this installation and maintenance leaflet.


DANGER!

 This symbol concerns people's safety. It points out situations which could lead to death or serious injuries.

ATTENTION!

 This symbol concerns the use of the equipment. It points out situations which could lead to damage or destroy the equipment.

NOTE!

 This symbol concerns information which can ease the installation and the use of the equipment.

STANDARDS QUOTED

- ISO6743/4 - Mineral oil
- ISO4406 (or NAS1638) - Oil pollution class
- DIN2353 - Piping quality

Disc brake - Power unit CE8L

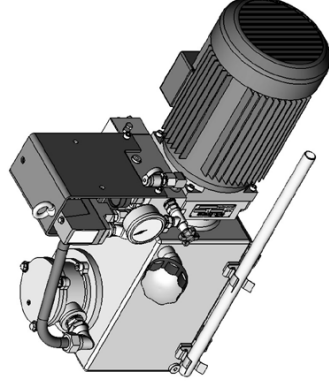
Installation and maintenance

1 - PRESENTATION

1-1 Use

The hydraulic power unit CE8L (fig.1) is intended to deliver an hydraulic pressure to open the emergency hydraulic brakes SH and TH.

Fig. 1



1-2 General characteristics

The CE8L hydraulic power unit is fitted with a gear pump and a motor of 2,2 kW at 1500 rpm for a nominal flow rate of 8,4 l/min (on network 50 Hz).

The maximal utilization pressure is 225 bar.

Frequency of operations = 100 operations / hour maximum

The caliper can be installed horizontally (CE8L-H) or vertically (CE8L-V) (reservoir at the bottom).

See flow diagram fig.7 and description fig.8.

Calipers are closed by means of a single solenoid valve EV1 (NO). For installations requiring a high level of safety, we advise the option OP1 (2 EV).

In addition, we recommend a device of permanent diagnosis of the solenoid valves operation (CS2EV) which allows the detection of a possible fault.

1-2 Operating conditions

Working conditions:


- Ambient temperature: -10 °C to +50 °C
 - Relative humidity ≤ 70 %
 - Dust in atmosphere ≥ 65 µ
 - Protection against vertically falling waters.
- Other conditions, consult Stromag France.

1-4 Recommendations

Only a close following of the instructions means a longer life and a good performance of the installation.

It is advised to bring a close supervising on each manipulation. These must be done in the cleanest possible way.

DANGER !

 Do not proceed to any operation on an installation under pressure.

Before delivery, our units are tested in our workshop to ensure their characteristics, the correct operation of the whole.

After receipt, our customers must proceed to the following operations:

- Visual control of the hydraulic power unit to ensure its conformity, to detect any problem occurred during transportation, its cleanliness, etc...
- Electrical connection of all the components of the power unit and their control (wiring examples on fig.3 + 4)
- Hydraulic connection of the power unit to the caliper.

Non contractual photographs.

Instructions of this manual must be adhered to, to obtain the performance and the safety of operation of the equipment.

Technical data	Leaflet No. T05570-01	Oils	Leaflet No. 8615-1	02/06/08	4/18
Options	No. A08555-01	Connection of a hydraulic unit	No. G08555-01		
Spare parts	No. S09580-01				

M08555-01-A

Non contractual photographs.
Instructions of this manual must be adhered to, to obtain the performance and the safety of operation of the equipment.

Technical data	Leaflet No. T05570-01	Oils	Leaflet No. 8615-1	02/06/08	4/18
Options	No. A08555-01	Connection of a hydraulic unit	No. G08555-01		
Spare parts	No. S09580-01				

M08555-01-A

Disc brake - Power unit CE8L

Installation and maintenance

2 - OPERATION

2-1 Flow diagram

See fig. 7.

2-2 Principle (fig. 7)

a) Opening of the calipers

When the hydraulic power unit is switched on, the solenoid valve EV1 (NO) closes and the motor M starts simultaneously. This motor drives the gear pump P1 which gives the oil pressure allowing the hydraulic calipers to open.

The opening of the pressure switch CP1, included in the working circuit, stops the motor M when working pressure reaches the maximum set level. Then, the installation stays under pressure with the motor M stopped. If pressure lowers down to the minimum level, the switch closes and starts the pump motor M again.

b) Closing of the calipers and braking

Switching off the motor M and the solenoid valve EV1 brings the oil back to the power unit reservoir and the pressure back to zero. Calipers close and braking torque is applied.

c) Manual opening of the calipers

With the flow limiter LD1 (fig.2) closed, the hand pump P2 provides the necessary pressure to open the calipers, in case of mains failure or manual operations on the calipers.

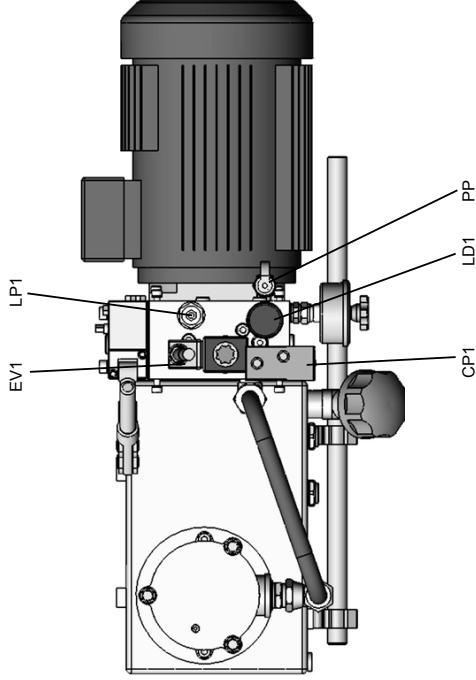
DANGER !

During normal use, the flow limiter LD1 (fig.2) must be imperatively in the open position (completely unscrewed).

d) Pressure limit valve

The pressure limit valves LP and LP1, factory set, protect the working circuit against fortuitous over pressures.

Fig. 2 - CE8L hydraulic unit without protecting cover



Non contractual photographs.

Instructions of this manual must be adhered to, to obtain the performance and the safety of operation of the equipment.

Technical data	Leaflet No. T05570-01	Oils	Leaflet No. 8615-1	02/06/08	5/18
Options	No. A08555-01	Connection of a hydraulic unit	No. G08555-01		
Spare parts	No. S09580-01				
M08555-01-A					

Disc brake - Power unit CE8L

Installation and maintenance

2-3 Options

Options of the CE8L power unit are described in the "Options" leaflet quoted in the bottom of the page.

Table 1 below sums up all these options :

Options	Description	Comments
MS	Motor 500V 50Hz or 690V 50Hz or Motor 230/400 V with PTC sensor	Other voltages, consult us.
EVS	EV coils voltage different from the standard	
K1	Electrical power unit integrated to the hydraulic power unit, Input voltage 400V 3 phases 50 Hz. + 230V single phase 50 Hz.	For CE8L standard and CE8L OP1. For the other voltages (MS and EVS), consult us.
K2	Electrical power unit integrated to the hydraulic power unit, Input voltage 400V 3 phases 50 Hz.	
OP1	Enhanced security return circuit by 2 solenoid valves.	Noncumulable options with option Y5.
OP1-OP2	Manual lowering with a dead man safety device.	For monitoring device of the 2 EV (CS2EV), consult us (APS).
OP1-OP3	Manual lowering with overspeed safety by solenoid valve 24VDC.	To equip the hydraulic unit CE8L-OP1-OP3 with an electrical unit, consult us (APS).
CS2EV	Monitoring device of the 2 solenoid valves EV1 and EV2, consult us.	For CE8L-OP1, CE8L-OP1-OP2, and CE8L-OP1-OP3.
Y5	The hydraulic unit is fitted with a proportional pressure limit valve for a regulated braking or the lowering of the load. The function of braking on/off is kept.	Noncumulable option with options OP1, OP2 et OP3. This option requires a specific electrical unit according to the control system (lowering of the load, constant deceleration, etc.), consult us (APS). R option enables to limit the full braking torque, consult us (APS).
OP4	Indicator switch of the position of the main control valve and of the lowering control valve (if option OP2 or OP3)	
OP6	Hydraulic unit for "iron and steel industry" with: a tight filling port 2 oil level sight glasses in pyrex no ventilation on the motor	This option enables to work in atmospheres with high concentration of dust and at ambient temperature of 60°C in continuous (90°C at the peak < 2 minutes 6 times per hour maximum).
OP10	Drip tray for hydraulic unit mounted horizontally	For CE8L-V (vertical) hydraulic unit, CE8L-K1 and CE8L-K2, consult us
RV	Drain valve for reservoir	

Non contractual photographs.

Instructions of this manual must be adhered to, to obtain the performance and the safety of operation of the equipment.

Technical data	Leaflet No. T05570-01	Oils	Leaflet No. 8615-1	02/06/08	6/18
Options	No. A08555-01	Connection of a hydraulic unit	No. G08555-01		
Spare parts	No. S09580-01				
M08555-01-A					

Disc brake - Power unit CE8L

Installation and maintenance

Options available requiring an adaptation (APS) :

Options	Description	Remarques
Z1	At the time of a braking order or a voltage failure, Z1 option allows a delay of caliper closing by maintaining a voltage on the coil of the solenoidvalve. (delay of 0,1 to 1,2 second).	Consult us.
Z2	At the time of a braking order or a voltage failure, Z1 option allows a delay of caliper closing by maintaining a voltage on the coil of the solenoidvalve. (delay of 0,1 to 20 seconds).	Consult us.
OP5	Indicator of clogging	Consult us.
OP7	Thermostat 80° for the reservoir	Consult us.
OP8	Electrical indicator of the oil level in the reservoir	Only for CE8L-V (vertical) hydraulic units. Consult us.

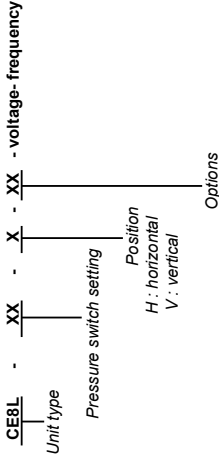
Disc brake - Power unit CE8L

Installation and maintenance

3 - CHARACTERISTICS

3-1 Designation

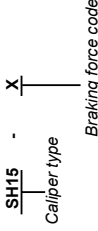
a) Power unit (table 2)



Example:

CE8L-20-V-OP6: hydraulic power unit CE8L with the maximum of the pressure limit switch set to 200 bar, fitted for a vertical mounting and steel plant environment.

b) Calipers (table 2)



Example: SH15-3

Table 2

Power unit type	Calipers types								Main limit valve LP	Limit switch CP1 mini/maxi	Hand pump limit valve LP1
	SH25	SH18	SH18B	SH15	SH9	SH6	SH5	TH9			
CE8L - 20	SH25-2	SH18-2	SH18B	--	SH9-3	--	SH5-6	--	225	180 / 200	250
CE8L - 18	--	--	--	SH15-3	SH9-2	SH6-3	--	--	205	150 / 180	230
CE8L - 16	SH25-1	--	--	SH15-2	--	--	SH5-5	TH9-3	205	140 / 160	230
CE8L - 14	--	SH18-1	--	SH15-1	SH9-1	SH6-2	SH5-4	--	165	110 / 140	180
CE8L - 11	--	SH18-0	--	--	--	SH6-1	SH5-3	TH9-2	140	85 / 115	160

The maximum number of calipers associated with the CE8L hydraulic unit is in the leaflet "Connection of a hydraulic unit" quoted below.

Example : calipers SH15 - 3 are related to the supply unit CE8L - 18.

All the values LP, LP1 and CP1 are pressures given in bar.

Non contractual photographs.

Instructions of this manual must be adhered to, to obtain the performance and the safety of operation of the equipment.

Technical data	Leaflet No. T05570-01	Oils	Leaflet No. 8615-1	02/06/08	8/18
Options	No. A08555-01	Connection of a hydraulic unit	No. G08555-01		
Spare parts	No. S09580-01				
					M08555-01-A

Disc brake - Power unit CE8L

Installation and maintenance

3-2 Hydraulic characteristics

a) Calipers associated

See table 2.

b) Mineral oil

A mineral oil must be imperatively used.
Characteristics conform to the standard ISO 6743/4.
Choose a type in accordance with the temperatures of utilization.
Grade L-HM or L-HV.
Avoid to mix oils of types HM and HV.
For oils with other characteristics, consult us.
Refer to the leaflet "Oils" quoted in the bottom of the page.

The reservoir capacity is :

- Horizontal or vertical installation : - High level = 8 litres
- Low level = 6 litres

3-3 Electrical characteristics

a) Motor M4

- 3 phase: 230/400V $\pm 10\%$ AC 50 Hz
- 2.2 kW, 4 poles
- Protection IP 55 class F
- Aluminium body, metallic terminal box, brass cable gland
- Other 3 phase voltage on option MS :
- 690VAC $\pm 10\%$ 50Hz
- 500VAC $\pm 10\%$ 50Hz
- 230/400VAC $\pm 10\%$ 50Hz with PTC sensor

To specify according to the following table :

Mains 3 phases	Motor 3 phases
230 - 240 VAC $\pm 10\%$ 50Hz	230/400VAC $\pm 10\%$ 50Hz (standard)
400 - 415 VAC $\pm 10\%$ 50Hz	230/400VAC $\pm 10\%$ 50Hz or 230/400VAC $\pm 10\%$ 50Hz with sensor PTC (option MS)
440 - 460 VAC $\pm 10\%$ 60Hz	500 VAC $\pm 10\%$ 50Hz (option MS)
500 VAC $\pm 10\%$ 50Hz	690 VAC $\pm 10\%$ 50Hz (option MS)
690 VAC $\pm 10\%$ 50Hz	

Non contractual photographs.

Instructions of this manual must be adhered to, to obtain the performance and the safety of operation of the equipment.

Technical data	Leaflet No. T05570-01	Oils	Leaflet No. 8615-1	9/18
Options	No. A08555-01	Connection of a hydraulic unit	No. G08555-01	
Spare parts	No. S09580-01			

M08555-01-A

Disc brake - Power unit CE8L

Installation and maintenance

5 - CONNECTION

5-1 Electrical connections

We advise you to follow industrial connection standards for electrical circuits.

a) Wiring examples (fig. 3 and 4)

The whole wiring connections are to be realised by the customer following examples fig. 3 and 4.

Fig. 3

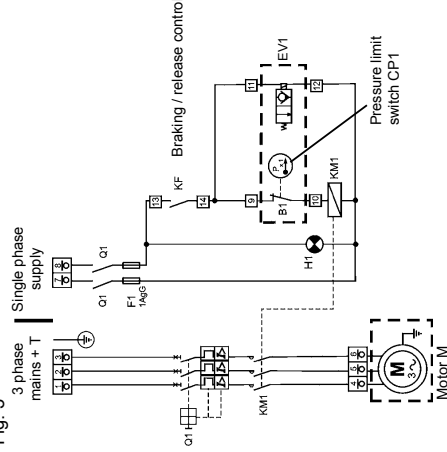
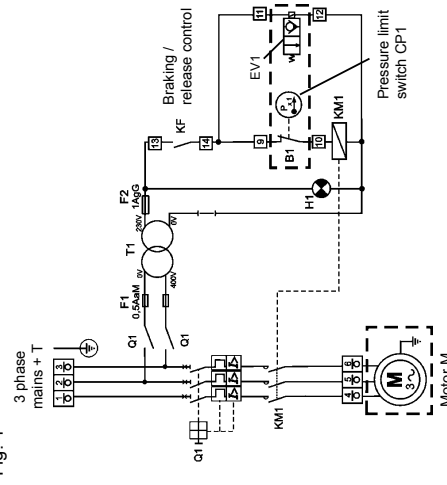


Fig. 4



--- provided by Stromag France

--- provided by Stromag France

On option, an electrical control system K1 (fig. 3) or K2 (fig. 4) is mounted integral with the hydraulic unit to simplify the customer wiring. The customer supplies the alternative current and braking/release control (KF). See "Options" leaflet quoted below

Non contractual photographs.

Instructions of this manual must be adhered to, to obtain the performance and the safety of operation of the equipment.

Technical data	Leaflet No. T05570-01	Oils	Leaflet No. 8615-1	02/06/08
Options	No. A08555-01	Connection of a hydraulic unit	No. G08555-01	10/18
Spare parts	No. S09580-01			

M08555-01-A

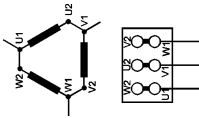
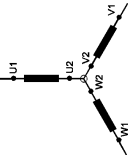
Disc brake - Power unit CE8L

Installation and maintenance

b) Motor M

- Be sure about the electrical power supply
- Electrical motor designed for voltage: 230 V Δ , 400 V \star $\pm 10\%$ 50Hz (other voltages on option MS)
- The motor supply must be protected by a thermal circuit breaker set on the current of the supply voltage (see motor identification plate)

Fig. 5

230V $\pm 10\%$ 50Hz400V $\pm 10\%$ 50Hz

- Connection of the electrical motor (terminal box). Set bridges regarding the voltage supply (fig. 5)
- Connect ground strip

c) Solenoid valve EV1 coil

Be sure about the single phase 230 V supply ($\pm 10\%$). Other voltages optional.

d) Pressure limit switch CP1

- Connect the switch
- The pressure switch is factory set.



ATTENTION !

For the general precautions of hydraulic power unit connection, refer to the leaflet quoted below.

6 - START-UP

6-1 Mineral oil

Refer to chapter 3-2

6-2 After a long term storage

For a long term storage, the reservoir must be filled with oil to avoid corrosion.
After a long storage, check through the filling port that the reservoir is clean and that it contains no water nor oxidation because of fortuitous condensation or infiltration. Rinse out.
Every precaution must be taken to prevent polluting agents from entering the reservoir.

6-3 Filling

- Fill up with oil via the filling cap up to the maximum level. It is essential to use a filtration unit fitted with a 5 μ m absolute filter
- Check that the flow limiter LD1 is opened
- Check that the motor runs in the right direction, it means in the way shown by the arrow. The caliper must open, if not, stop immediately the motor and swap 2 phases
- Switch on the solenoid valve EV1 and the motor M and check that the oil level does not fall below the minimum level

At the maximum pressure level of the limit pressure switch CP1, the motor M is switched off. The pressure can be read on the manometer 1G, the isolation cock 1Q being opened only during the reading.

ATTENTION!

Close imperatively the isolation cock 1Q during normal use. If not, you can destroy the manometer 1G.

- It is essential to purge the facility via the purge screw on each caliper:
 - the hydraulic power unit being running, purge until having an oil stream free of air and clean
 - Close the screw and ensure that they are locked
 - Refill with oil if necessary.

Disc brake - Power unit CE8L

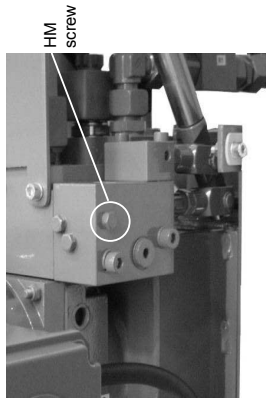
Installation and maintenance

6-4 Opening the brakes without voltage

Goal: release the calipers in case of a mains failure or a problem on the power unit working circuit
Remove the cap protecting the power unit components
Loosen the counter nut of the flow limiter LD1 (fig.2), close it and open the isolation cock 1Q of the manometer 1G
Actuate the hand pump P2 until reaching the maximum pressure, read on the manometer 1G. We will find this value on the table 2.

NOTE !

- If necessary (no pressure), proceed with the hand pump priming (flow limiter LD1 closed) as following:
- unscrew the HM screw (spanner of 10) on the hand pump body
 - actuate the hand pump until oil flows (prime by making suction with the finger)
 - screw back again the HM screw



DANGER!

After mains restoration and before starting up the installation, open **imperatively** the flow limiter LD1 and close the isolation cock 1Q of the manometer 1G before switching on the hydraulic power unit.



6-5 Pressure limit valves setting

The pressure limit valves LP and LP1 (fig. 8) are set and sealed in our factory and do not need any further setting.
Pressure limit switch setting value: see table 2.

Non contractual photographs.

Instructions of this manual must be adhered to, to obtain the performance and the safety of operation of the equipment.

Technical data	Leaflet No. T05570-01	Oils	Leaflet No. 8615-1	02/06/08	11/18
Options	No. A08555-01	Connection of a hydraulic unit	No. G08555-01		
Spare parts	No. S09580-01				

M08555-01-A

Non contractual photographs.
Instructions of this manual must be adhered to, to obtain the performance and the safety of operation of the equipment.

Technical data	Leaflet No. T05570-01	Oils	Leaflet No. 8615-1	02/06/08	12/18
Options	No. A08555-01	Connection of a hydraulic unit	No. G08555-01		
Spare parts	No. S09580-01				

M08555-01-A

Disc brake - Power unit CE8L

Installation and maintenance

7 - MAINTENANCE

7-1 Preventing control

We advice you the following periodic operations:

COMPONENTS	MONITORING CHECKING	FREQUENCE DES OPERATIONS
POWER UNIT AND RESERVOIR ASSEMBLY	- Sealing of installation - Fluid level - Cleanness and water content of oil	Every routine control of the installation
RESERVOIR	Drain off	Every 5 years or every 400,000 actuations of the motor M
FILTER F	Checking and cleaning the oil filter (return circuit) Replacing the oil filter cartridge	Once a year or every 50,000 actuations of the motor M - At the first oil replacement - Every 5 years or every 400,000 actuations of the motor M

This kind of hydraulic power unit needs only a monitoring of the oil cleanliness and water content. It needs also a regular cleaning of the return filter F.

7-2 Oil replacement

The hydraulic fluid will be replaced:

- after 3 months of normal use following the first start-up
- after a period of 400 000 actuations of the motor or every 5 years at least or after checking the oil pollution class (maximum class required according to standard ISO4406 class 19/17/14 or NAS1638 class 8). The pollution rate influence the power unit life duration.

Follow the instructions and the rules regarding treatments of fluids (polluted or not). Avoid to mix different types of oil.

Disc brake - Power unit CE8L

Installation and maintenance

8 - FAULT DIAGNOSIS

Some general recommendations:

- Check wiring (false contact, ...) and voltages
- Check the oil level in the power unit (leaks, ...)
- In case of jam of some components (check valve, solenoid valve, ...), completely drain off the power unit and/or let the oil runs in forced circulation during some minutes in order to eliminate fortuitous impurities. The forced circulation is obtained by starting up the motor by manually actuating the contactor which drives the motor; the solenoid valve EV/1 is not powered on or its coil is removed. If the problem remains, replace the faulty component(s).

We will use the table on the next page to repair the power unit.

If the failure still remains, consult us

Non contractual photographs.

Instructions of this manual must be adhered to, to obtain the performance and the safety of operation of the equipment.

Technical data	Leaflet No. T05570-01	Oils	Leaflet No. 8615-1	02/06/08	13/18
Options	No. A08555-01	Connection of a hydraulic unit	No. G08555-01		
Spare parts	No. S09580-01				
					M08555-01-A

Non contractual photographs.

Instructions of this manual must be adhered to, to obtain the performance and the safety of operation of the equipment.

Technical data	Leaflet No. T05570-01	Oils	Leaflet No. 8615-1	02/06/08	14/18
Options	No. A08555-01	Connection of a hydraulic unit	No. G08555-01		
Spare parts	No. S09580-01				
					M08555-01-A

Disc brake - Power unit CE8L

Installation and maintenance

SYMPTOMS	POSSIBLE CAUSE	CHECKING AND CURE
THE CALIPER DOES NOT OPEN	The motor M does not run	<ul style="list-style-type: none">- Check connections- Check voltage on pressure switch CP1 terminals- Check voltage on motor terminals- Check coils of the motor
THE CALIPER DOES NOT OPEN BUT THE MOTOR RUNS	- The motor M runs in the wrong way	<ul style="list-style-type: none">- Check that the motor runs in the clockwise way, seen on the fan side. If not, stop it immediately and swap 2 phase wires of the motor
	- The solenoid valve EV1 is faulty	<ul style="list-style-type: none">- Check that the solenoid valve coil is supplied and generate a magnetic field (under voltage, the coil is relatively difficult to remove). Change the solenoid valve
	- The pump is worn out	<ul style="list-style-type: none">- Control the pressure under forced circulation. With the solenoid valve EV1 under voltage and the manometer cock 1Q opened, manually actuate the contactor driving the motor. You will obtain the pressure of the main limit valve LP. If not, consult us
THE CALIPER OPENS, BUT THE MOTOR M DOES NOT STOP	- One of the pressure limit valves LP and LP1 is faulty	<ul style="list-style-type: none">- Control the pressure under forced circulation. With the solenoid valve EV1 under voltage and the manometer cock 1Q opened, manually actuate the contactor driving the motor. You will obtain the pressure of the main limit valve LP.With the flow limiter LD1 closed and the isolation cock 1Q of the manometer opened, pump with the hand pump P2. You will obtain the pressure of its limit valve LP1. If not, consult us
	- Pressure switch CP1 is faulty	<ul style="list-style-type: none">- Check the switching of the pressure switch by using the hand pump P2, reading pressure on the manometer 1G with its isolation cock 1Q opened.
POWER UNIT FREQUENT STARTINGS WHEN THE CALIPER IS OPENED	- External leaks	<ul style="list-style-type: none">- Check hydraulic connections
	- Internal leaks	<ul style="list-style-type: none">- Check the solenoid valve EV1, the check valves (CA1 and CA2)
DELAYED OPENING OF THE CALIPER	- Air in the hydraulic circuit	<ul style="list-style-type: none">- Purge the hydraulic circuit- Check the hydraulic connections
	- Air in the hydraulic circuit	<ul style="list-style-type: none">- Purge the hydraulic circuit
DELAYED BRAKING (LONGER STOPPING DISTANCE)	- The flow limiter LD1 is not correctly opened	<ul style="list-style-type: none">- Open the isolation cock
	- The solenoid valve EV1 does not open correctly	<ul style="list-style-type: none">- Change the solenoid valve

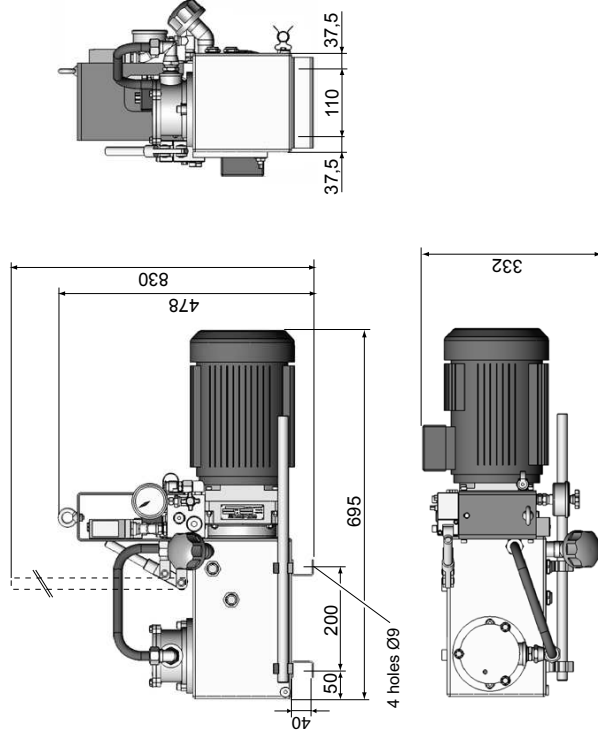
Non contractual photographs.

Instructions of this manual must be adhered to, to obtain the performance and the safety of operation of the equipment.

Technical data	Leaflet No. T05570-01	Oils	Leaflet No. 8615-1	02/06/08	15/18
Options	No. A08555-01	Connection of a hydraulic unit	No. G08555-01		
Spare parts	No. S09580-01				

M08555-01-A

Fig 6 - Dimensions



Weight : 54 kg without oil

Representation: CE8L-H (horizontal position)

Disc brake - Power unit CE8L

Installation and maintenance

Non contractual photographs.

Instructions of this manual must be adhered to, to obtain the performance and the safety of operation of the equipment.

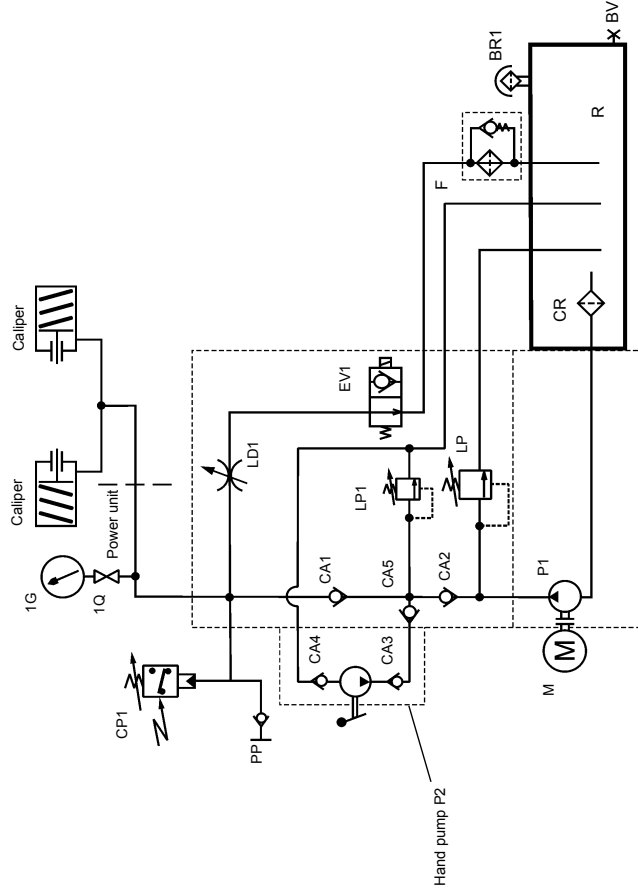
Technical data	Leaflet No. T05570-01	Oils	Leaflet No. 8615-1	02/06/08	16/18
Options	No. A08555-01	Connection of a hydraulic unit	No. G08555-01		
Spare parts	No. S09580-01				

M08555-01-A

Disc brake - Power unit CE8L

Installation and maintenance

Fig. 7 - Flow diagram of the hydraulic power unit



Components:

- | | | | |
|-----|-----------------------|-----|---------------------------------|
| BR1 | Filling port | LD1 | Flow limiter |
| BV | Draining port 1/4"G | LP | Main pressure limit valve |
| CA1 | Check valve | LP1 | Hand pump pressure limit valve |
| CA2 | Check valve | M | Electrical motor |
| CA3 | Hand pump check valve | P1 | Gear pump |
| CA4 | Hand pump check valve | P2 | Hand pump |
| CA5 | Check valve | PP | Pressure port |
| CP1 | Pressure switch | R | Reservoir |
| CR | Suction strainer | 1G | Manometer |
| EV1 | Solenoid valve | 1Q | Isolation cock of the manometer |
| F | Filter | | |

Non contractual photographs.
Instructions of this manual must be adhered to, to obtain the performance and the safety of operation of the equipment.

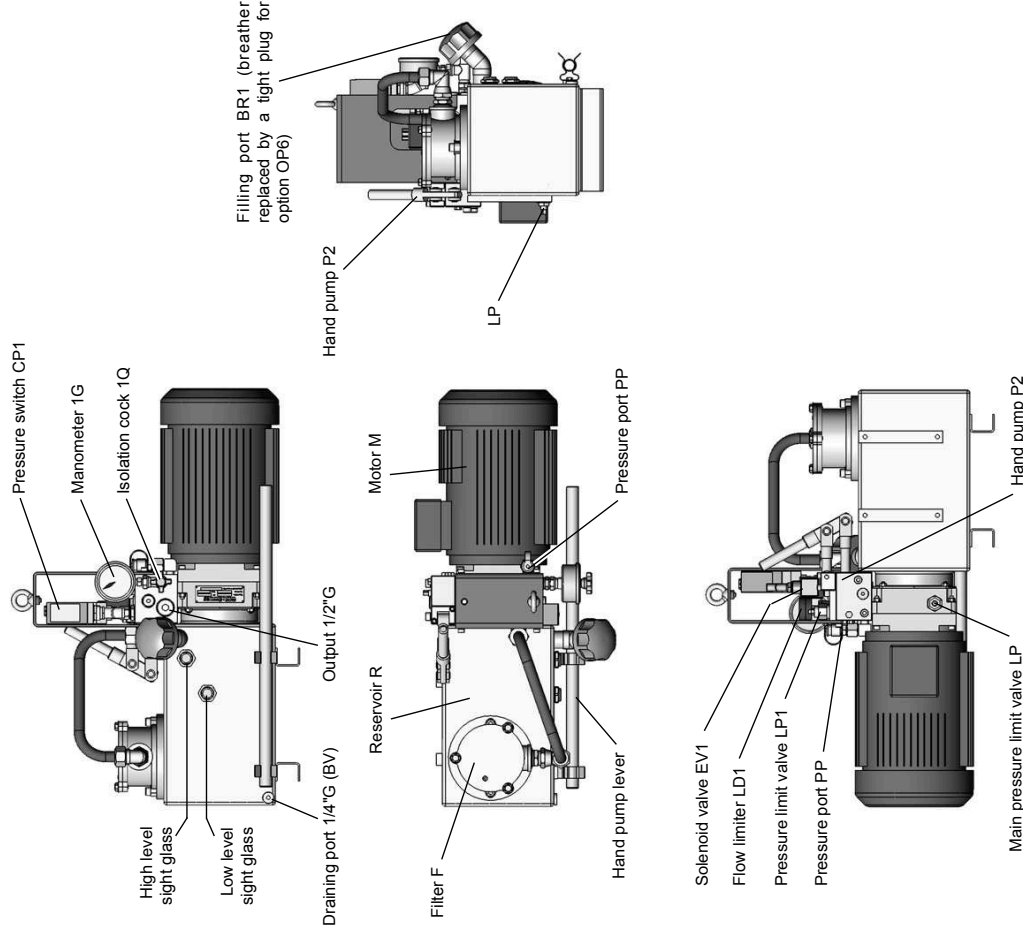
Technical data	Leaflet No. T05570-01	Oils	Leaflet No. 8615-1	02/06/08	17/18
Options	No. A08555-01	Connection of a hydraulic unit	No. G08555-01		
Spare parts	No. S09580-01				

M08555-01-A

Disc brake - Power unit CE8L

Installation and maintenance

Fig. 8 - Components of the hydraulic unit CE8L standard (shown in horizontal version)



Non contractual photographs.
Instructions of this manual must be adhered to, to obtain the performance and the safety of operation of the equipment.

Technical data	Leaflet No. T05570-01	Oils	Leaflet No. 8615-1	02/06/08	18/18
Options	No. A08555-01	Connection of a hydraulic unit	No. G08555-01		
Spare parts	No. S09580-01				

M08555-01-A

5.28 FLUSHING PROCEDURE

Reference document : "Generic Flushing procedure through quick couplings_English_rev01.pdf"

FLUSHING PROCEDURE

THROUGH QUICK COUPLINGS

!! NO CYLINDER MOTION BEFORE THE FLUSHING !!

Required material:

- Flushing by pass
- Fluid contamination control unit

Hydraulic lines to be flushed:

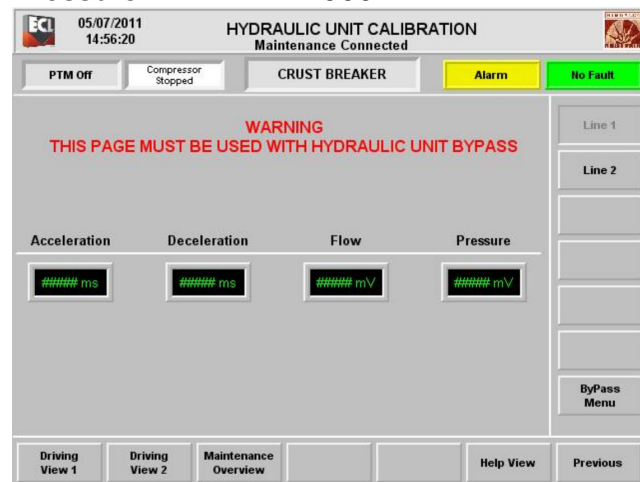
- Lines connected to all the drilled blocks of the directional valves

Procedure:

It is necessary to flush before any motions of the tools in order not to pollute the circuit of the tools (that has been already flushed).

- Clean the quick couplings to be disconnected and caps
- Disconnect the **PRESSURE** quick coupling on the drilled block of the directional valves
- Disconnect the **RETURN** quick coupling on the drilled block of the directional valves
- Connect the **flushing by-pass** circuit on the two hoses (pressure and return)
- Connect the fluid contamination control unit on the fluid control by-pass
- Put caps on the other quick couplings to protect them from dust
- Start the hydraulic power unit
- Select the “hydraulic unit calibration” view in the panel view
- Adjust ramps, flow and pressure and select the correct pressure line to be flushed:

Acceleration: 2 000 ms
Deceleration: 2 000 ms
Flow: 10 000 mV (= full flow)
Pressure: 2 000 mV



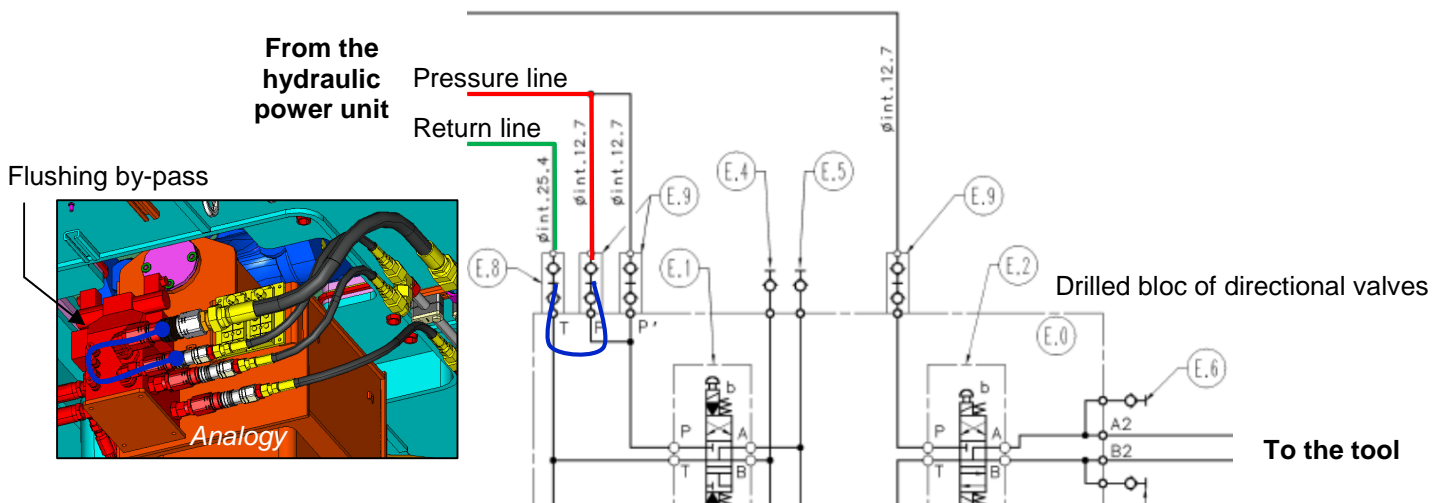
Analogy

- The oil is now flowing and flushes the corresponding hydraulic circuit, let it run at least 10 minutes
- Check the contamination grade using the fluid control unit that has been connected on the flushing by-pass. For our application the required grade is a **minimum filtration level of 17/15/12 in accordance with the ISO 4406:1999 standard (NAS1638: 6)**.
Note: read carefully the manual before using the fluid control unit.
- Flush and check with controller every 10-15 minutes until you reach the target
- To stop the flow, adjust settings to zero or leave the “hydraulic unit calibration” view

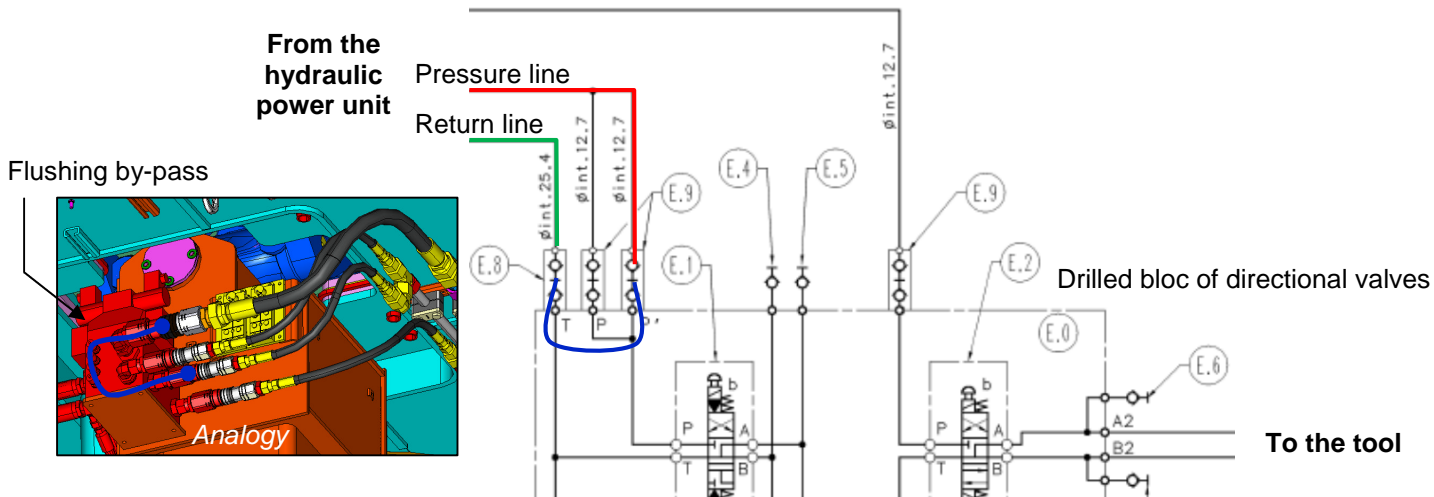
For multi lines hydraulic circuit:

All the lines must be flushed using the flushing by-pass and the contamination level must be checked by using the fluid control unit on each line

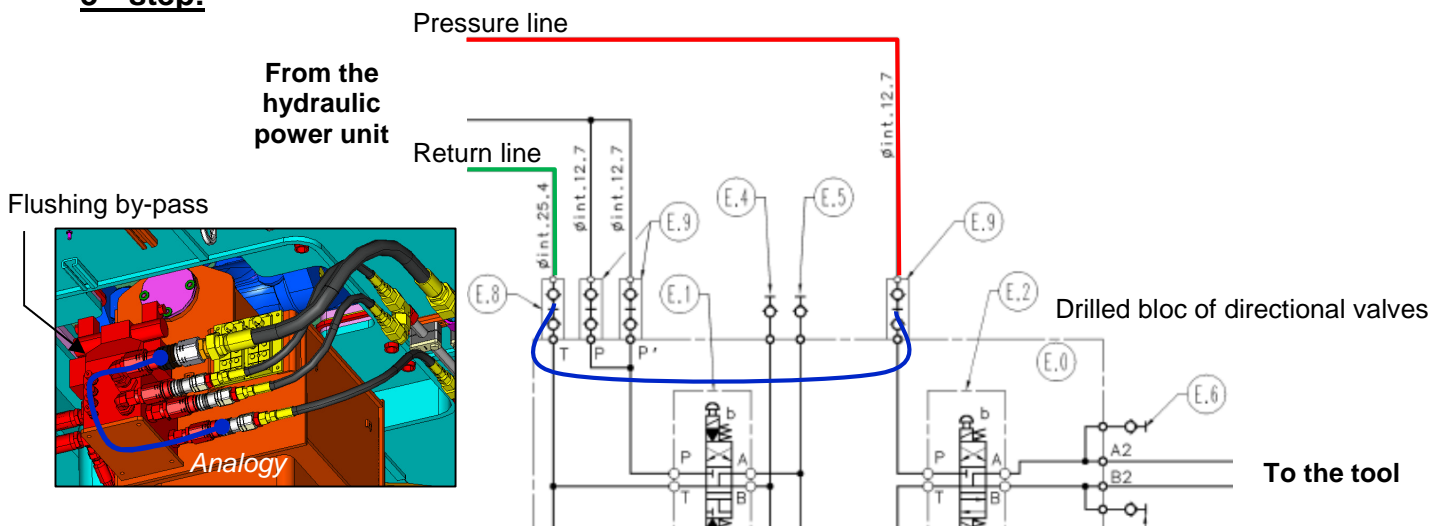
1st step:



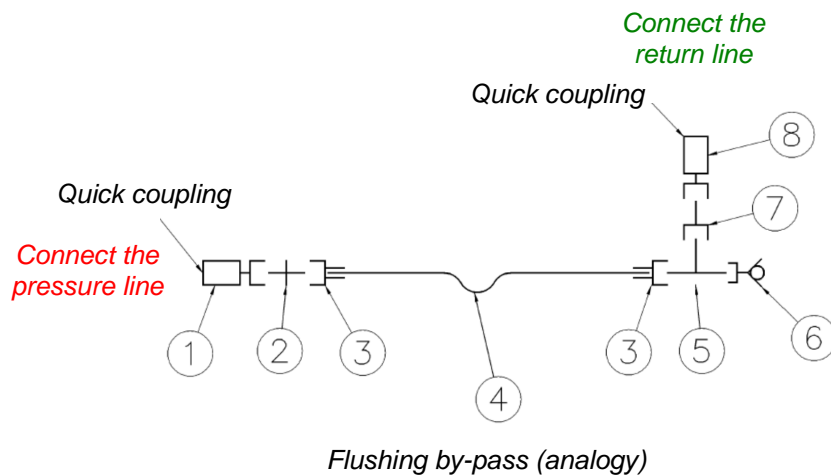
2nd step:



3rd step:



Flushing by-pass:

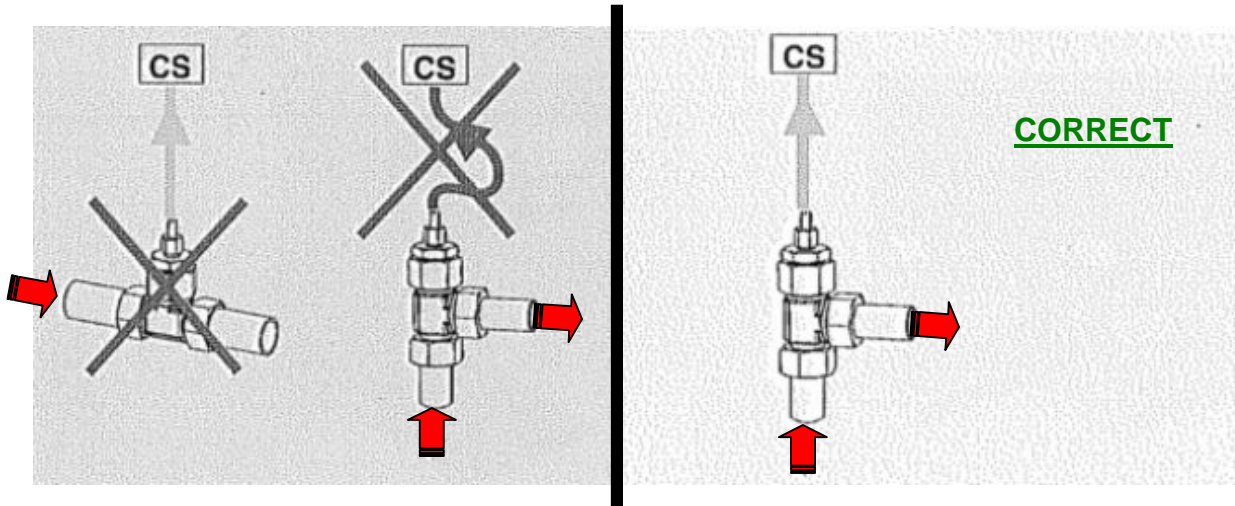


Fluid contamination control unit information:

Connection:

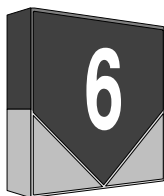
The contamination monitor must be connected on the corresponding pressure plug installed on the flushing by-pass. The oil direction must be as indicated below. The controller sensor must be straightened in line with the fluid arrival.

CS: Controller sensor



Risk assessment:

Task	Potential hazard	To be checked before doing the task
Flushing of systems	Oil spillage, oil temperature during flushing, personal injuries.	Use proper PPE's. Experienced person to carry out the process. Gradual increase of pressure to system. Periodic monitoring for leakage if any.



PNEUMATIC MAINTENANCE

CONTENTS OF THE CHAPTER

MPTM PNEUMATICAL DIAGRAM	6.1-1
PNEUMATIC ADJUSTMENT VALUES	6.2-1
COMPRESSOR MS 840 L MANUAL	6.3-1
PREVENTIVE MAINTENANCE OF COMPRESSOR MS 840 L	6.4-1
AIR LINE REGULATORS 06R & 07R	6.5-1
VALVES T 211.25...H	6.6-1
VALVES 6312D	6.7-1
PNEUMATIC CYLINDER A SERIES	6.8-1
VALVES SERIES N	6.9-1
ATOMISATION – NOZZLE TYPE XB-XASR	6.10-1
FLOW CONTROLLER F	6.11-1
CRUST-BREAKER LUBRICATOR L68M	6.12-1
INSONORIZED CRUST BREAKER Z92	6.13-1
PNEUMATIC CYLINDER VDMA SERIES	6.14-1
MANUAL FOR THE AIR DRYING	6.15-1
MANUAL FOR THE CONDENSATES SEPARATOR TYPE K	6.16-1
MANUAL FOR THE TANKS	6.17-1
CONDENSATION CAPACITIVE DRAIN 13 CO PN 25	6.18-1
WAY VALVES DN 15 TO DN 50	6.19-1

6.1 MPTM PNEUMATICAL DIAGRAM

ITEM	DESCRIPTION	QTY	DWG CODE	DWG REV	CLIENT NOTES
	1. MPTM PNEUMATICAL DIAGRAM		1-10-858-68	06	
	1.1. MPSC PNEUMATICAL COMPONENTS LIST		1-10-858-69		
...	MULTIPURPOSE POT TENDING MACHINE pneu	1	1-10-858-68		
....	PNEUMATIC FUNCTIONS ADJUSTING MANUAL	1	1-10-951-07		
A.0.	SOUNDPROOF COMPRESSED AIR UNIT MS 880 L	1	1-10-872-64		
A20.	AIR COMPRESSED TREATMENT ASS'Y	1	1-10-896-01		
A20A	FINAL CONDENSER REF.312-34663	1	1-10-521-57		
A20B	CAPACITIVE DRAIN BEKOMAT 3 E25	1	1-10-927-71		
A30.	BALL VALVE F.F. 0402 40 48 2"	1	0-01-325-84		
A31.	BALL VALVE F.F. 0402 32 42 1"1/4	1	0-01-325-83		
A32.	BALL VALVE F.F. 0402 32 42 1"1/4	1	0-01-325-83		
A33.	BALL VALVE F.F. 0402 32 42 1"1/4	1	0-01-325-83		
A34.	BALL VALVE F.F. 461 2" PADLOCKING	1	0-10-325-69		
A35.	PRESSURE GAUGE REF. P6G ERB2140	1	1-10-085-98		
A36.	BALL VALVE F.F. 0402 07 13 1/4"	1	0-01-325-79		
B.1	BALL VALVE RIGHT ANGLED FLOW F.F. 0462 0	2	0-01-325-85		
B.2	REGULATOR 06 R 1 16 A C 1L 039	2	1-10-486-76		
B.3	VALVE T211 25 22 H	1	0-06-325-77		
B.3A	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
B.3B	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
B.4	VALVE T211 25 22 H	1	0-06-325-77		
B.4A	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
B.4B	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
B.5	VALVE T211 25 22 H	1	0-06-325-77		
B.5A	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
B.5B	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
B.6	VALVE T211 25 22 H	1	0-06-325-77		
B.6A	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
B.6B	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
B.7	ROUND PIPE 4x6	1			
C.1.	BALL VALVE RIGHT ANGLED FLOW F.F. 0462 0	1	0-01-325-86		
C.2.	PNEUMATIC VALVE 6312D-271-PM-611JJAL01	1	1-10-321-59		
C.2A	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
C.2B	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
C.3	MUFFLER 3/4" BSP	1	0-00-332-46		
C.5	PNEU CYLINDER NFPA P3 101.6/34.9 S 55.6	4	1-10-191-78		
C.6	BREATHER R.1C.15-2 REF E 402822 SD V20	4	0-01-327-09		
C10.	TAPPING AIR SUPPLY OR ARB FEEDING				
C11.	BALL VALVE F.F. 0402 32 42 1"1/4	1	0-01-325-83		
C12.	BALL VALVE F.F. 0402 07 13 1/4"	1	0-01-325-79		

MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

ITEM	DESCRIPTION	QTY	DWG CODE	DWG REV	CLIENT NOTES
C13.	QUICK UNION F SS-QF-16-B-16PM	1	1-10-973-55		
C14.	PRESSURE GAUGE REF. P6G ERB2140	1	1-10-085-98		
D.2.	BALL VALVE RIGHT ANGLED FLOW F.F. 0462 0	1	0-01-325-86		
D.3A	REGULATOR 07 R 2 13 A C 1	1	1-10-130-85		
D.3B	PRESSURE GAUGE REF. P6G ERB2140	1	1-10-085-98		
D.4.	VALVE N3 55 N 8 045 49 24V DC	1	1-10-039-97		
D.4A	CONNECTOR FOR SV REF 931 298-004	1	1-10-268-62		
D.4B	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
D.4C	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
D.5.	MUFFLER 1/2" BSP	1	0-00-332-49		
D.6.	PNEUMATIC MUFFLER AN200-02 R 1/4"	1	0-00-332-02		
D.7	FLEXIBLE BELLOW TYPE 4"1/2X3 REF9 109 40	3	1-10-034-18		
D.8	FLEXIBLE BELLOW TYPE 2"3/4x2 REF 9 109 0	4	1-10-205-09		
E.1	BALL VALVE F.F. 0402 07 13 1/4"	1	0-01-325-79		
E.2	PRESSURE REGULATING REF 11-400-2G-PC103	1	0-02-327-64		
E.3	PRESSURE GAUGE REF G1B43 2,5 0 - 2,5 B	1	1-10-428-31		
E.4	NOZZLE REF XB-XA00SR400A 1/4"Gaz SS3INOX	1	1-10-369-55		
E.5	RECUPERATION TANK	1	1-10-886-67		
F.1	BALL VALVE RIGHT ANGLED FLOW F.F. 0462 0	2	0-01-325-85		
F.2	REGULATOR 06 R 1 16 A C 1L 039	2	1-10-486-76		
F.3	VALVE T211 25 22 H	1	0-06-325-77		
F.3A	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
F.3B	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
F.4	VALVE T211 25 22 H	1	0-06-325-77		
F.4A	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
F.4B	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
F.5	VALVE T211 25 22 H	1	0-06-325-77		
F.5A	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
F.5B	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
F.6	VALVE T211 25 22 H	1	0-06-325-77		
F.6A	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
F.6B	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
F.7	ROUND PIPE 4x6	1			
G.1	VALVE T211 25 22 H	1	0-06-325-77		
G.1A	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
G.1B	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
G.2	VALVE T211 25 22 H	1	0-06-325-77		
G.2A	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
G.2B	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
G.3	PNEUMATIC MUFFLER AN200-02 R 1/4"	1	0-00-332-02		
G.4	BALL VALVE F.F. 0469 07 13 1/4"	1	0-05-325-96		
G.5	PNEU CYLINDER D.50/20 STROKE 80	1	1-10-216-10		
G.6A	QUICK UNION DN.8 REF.20300307	1	1-10-207-10		
G.6B	UNION DN.8 REF.25500101	1	1-10-207-11		
H.1	BALL VALVE RIGHT ANGLED FLOW F.F. 0462 1	1	0-01-325-87		
H.2	VALVE N3 55 N 8 045 49 24V DC	1	1-10-039-97		



MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

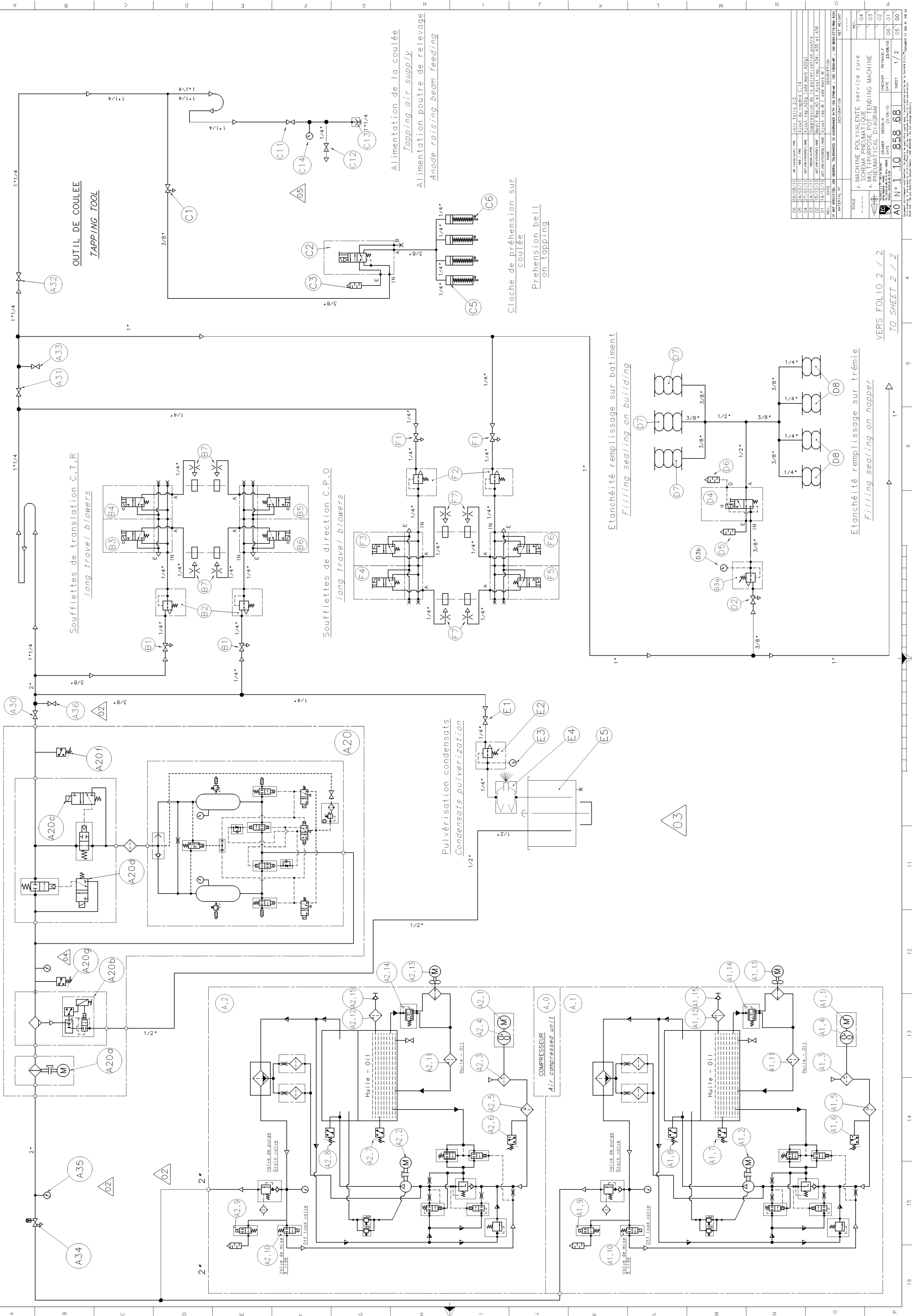
ITEM	DESCRIPTION	QTY	DWG CODE	DWG REV	CLIENT NOTES
H.2A	CONNECTOR FOR SV REF 931 298-004	1	1-10-268-62		
H.2B	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
H.2C	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
H.3	MUFFLER 1/2" BSP	1	0-00-332-49		
H.4	PNEUMATIC MUFFLER AN200-02 R 1/4"	1	0-00-332-02		
H.5A	REGULATOR 07 R 4 11 A C 1	1	1-10-130-88		
H.5B	PRESSURE GAUGE REF. P6G ERB2040	1	0-10-241-23		
H.6	CALIBRATED BUTT-END D.15,5	1	0-01-333-36		
H.7	FLUIDIZATION HOSE D.70	1	0-00-041-14		
H.8.	CHECK VALVE IT-100-1/2"	1	0-01-325-33		
I.1.	BALL VALVE RIGHT ANGLED FLOW F.F. 0462 1	1	0-01-325-87		
I.2.	PNEUMATIC VALVE 6312D-371-PM-611JJAL01	1	1-10-322-60		
I.2A	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
I.2B	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
I.3.	MUFFLER 1/2" BSP	1	0-00-332-49		
I.4.	FLOW CONTROLLER 9-F-600-B-11	2	0-00-326-06		
I.5A	SLIDING VALVE DN250 GN10	1	1-10-033-70		
I.5B	ALUMINE MEASURE 17M3 DRAO 500 (Gr.10)	1	1-10-033-71		
I.6.	FLOW REGULATOR VALVE MICRO-TROL R24-200-	1	1-10-040-80		
I.7.	PRESSURE GAUGE REF. P6G ERB2040	1	0-10-241-23		
I.8.	CHECK VALVE IT-100-1/2"	1	0-01-325-33		
J.1	BALL VALVE F.F. CIM 250-1"	1	0-02-325-09		
J.2	VALVE N3 55 7 8 045 49 24V DC	1	1-10-250-48		
J.2A	ADAPTER 1"NPTF 1"BSPT H.60	1	1-10-246-66		
J.2B	ADAPTER 1"NPTF 1/2"BSPT H.51	1	1-10-247-85		
J.2C	CONNECTOR FOR SV REF 931 298-004	1	1-10-268-62		
J.2D	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
J.2E	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
J.4.	PNEUMATIC MUFFLER AN200-02 R 1/4"	1	0-00-332-02		
J.5A	QUICK UNION DN.19 REF.20300278	1	1-10-198-46		
J.5B	UNION DN.19 REF.25500310	1	1-10-198-54		
J.9.	LUBRICATOR L68M-8GP-EJQ MICRO-FOG 1"	1	1-10-172-58		
J.9A	FIXING SQUARE 18-001-979	1	0-04-328-34		
J10.	INSONORIZED CRUST BREAKER Z.92	1	0-00-348-05		
J11.	FILTER MANN REF 67 502 62 026 M20X1,5	1	0-00-328-06		
J12A	HYDR. MALE PUSH-PULL 7101.0006-34 00 02	1	0-04-333-31		
J12B	HYD. FEMALE PUSH-PULL 7121.0006-34 00 08	1	0-04-333-32		
J12C	FEMALE PLUG 7103.0006-32 03 07	1	0-05-339-21		
J12D	MALE PLUG 7123.0006-32 03 18	1	0-00-339-55		
K.1A	PNEUMATIC VALVE 6312D-371-PM-611JJAL01	1	1-10-322-60		
K.1B	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
K.1C	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
K.2A	REGULATOR 07 R 3 13 A C 1	1	1-10-119-07		
K.2B	PRESSURE GAUGE REF. P6G ERB2140	1	1-10-085-98		
K.3.	CHECK VALVE IT-100-1/2"	1	0-01-325-33		
K.4.	FLOW CONTROLLER 9-F-800-B-11	1	0-00-326-08		


MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

ITEM	DESCRIPTION	QTY	DWG CODE	DWG REV	CLIENT NOTES
K.5.	FLOW CONTROLLER 9-F-800-B-11	1	0-00-326-08		
K.6.	PNEU CYLINDER NFPA X2 127/34.9 S 1700	1	1-10-912-84		
L.1A	QUICK UNION DN.11 REF.20300138	1	1-10-198-42		
L.1B	UNION DN.11 REF.25500158	1	1-10-198-49		
L.2.	BALL VALVE F.F. 0469 13 21 1/2"	1	0-05-325-31		
L.3.	MUFFLER 3/4" BSP	1	0-00-332-46		
L.4.	VALVE T211 25 22 H	1	0-06-325-77		
L.4A	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
L.4B	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
L.5.	VALVE T211 25 22 H	1	0-06-325-77		
L.5A	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
L.5B	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
L.6.	VALVE T211 25 22 H	1	0-06-325-77		
L.6A	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
L.6B	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
L.7.	PNEU CYLINDER ISO D.63/20 STROKE 60	1	1-10-172-97		
L.7A	OSCILLATING BRACKET REF.43400375	1	1-10-430-91		
L.7B	OSCILLATING CLEVIS REF.43400366	1	1-10-430-88		
L.8.	PNEU CYLINDER MINI D.32/12 STROKE 25	1	1-10-199-48		
L.8A	ROD CLEVIS FOR MINI CYLINDER	1	1-10-199-63		
L.9.	SILENCER SHORT FRITTED 1/4"	1	1-10-202-77		
N.1	TURNING UNION	1			
N.1.	UNION POHL TYPE 1"	1	0-06-333-03		
N.2	BALL VALVE VENTED F.F. CIM 350-1"	1	0-02-325-68		
S.1.	PNEUMATIC VALVE 1353G 611 DA 3 AL01	1	0-05-325-35		
S.1A	CONNECTOR FOR SV REF 931 298-004	1	1-10-268-62		
S.1B	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
S.1C	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
S.2	MUFFLER 1"1/4 BSP	1	0-00-332-50		
S.3	VALVE N3 25 8 5 002 49	1	1-10-372-67		
S.3A	CONNECTOR FOR SV REF 931 298-004	1	1-10-268-62		
S.3B	BENDED CONNECTOR TYPE GDML 2011-LED 24	1	0-07-220-04		
S.3C	SEAL OF CONNECTOR GDM 3-16	1	0-07-220-27		
S.4	BALL VALVE VENTED F.F. CIM 350-1"	1	0-02-325-68		
S.5	PNEUMATIC MUFFLER AN200-02 R 1/4"	1	0-00-332-02		
S.6	CHECK VALVE IT-100-1"	1	0-01-325-21		
S.7A	QUICK UNION DN.19 REF.20300278	1	1-10-198-46		
S.7B	UNION DN.19 REF.25500310	1	1-10-198-54		
S10.	FLOW CONTROL VALVE 9-F-1600-B-11	1	0-00-326-10		
S11.	FLOW CONTROL VALVE 9-F-1200-B-11	1	0-00-326-09		
S12.	PNEU CYLINDER NFPA P1 254/63.5 S 450	1	1-10-118-31		





06	09/08/11	JM 144901049 / PRE	Ajout du feuille 2/2
05	24/03/11	JNE / PRE	Ajout du copier C.14
04	27/01/11	ACT/MY2009S / JNE	Ajout exp A25g (old mtr A25g)
03	27/01/11	KOON/KPRE	Suppression de la pulvérisation pour le
02	27/01/11	ACT/MY2009S / JNE	Ajout exp M (old mtr A25, A25 et A26
01	14/12/10	ACT/MY2009S / JNE	Ajout exp M (old mtr M)
REV.	DATE	NOME	DESCRIPTION
IF NOT SPECIFIED USE GENERAL TOLERANCES IN ACCORDANCE WITH ISO 2768-MS ; ISO 13260-SP ; ISO 8062-RT-MK-MM (G)			
		DESIGNATION	NET WEIGHT
SCALE		REV.	
		04	
f. MACHINE POLYVALENTE service cuve		03	
g. SCHEMA PNEUMATIQUE		02	
h. MULTIPOSE POT TENDING MACHINE		06 01	
PNEUMATIC DIAGRAM		CHECKER : RETNAUD, F	DATE : 23/08/10
DRAWER : HEOLIN, N		DATE : 23/08/10	
A0 N° 1 0 858 68		SHEET	1 / 2
A0 N° 1 0 858 68		00	

N1

VIENS du FOLIO 1 / 2
COME FROM FOLIO 1 / 2

N2

Fluidisation trémie
Hopper fluidization

Clapet trémie
Hopper gate

Piqueur
Crust breaker

Fluidisation doseur
Dosing unit fluidization

PELLE A DECHETS
Butt/Bath grab

Verrouillage flexible
tube à bain
Bath feeding locking

Déverrouillage serrage
Clamp actuator unlocking

Descente serrage
Clamp actuator lowering

06	09/08/11	REVISION	AUTRE	REP.	J. S. SUPPLIANT
05	24/03/11	PRE	PRE	VOIT FOLIO 1 / 2	See folio 1
04	27/07/11	ACTIVATION	PRE	VOIT FOLIO 1	(see folio 1)
03	24/07/11	REVISION	PRE	VOIT FOLIO 1	(see folio 1)
02	24/07/11	REVISION	PRE	VOIT FOLIO 1	(see folio 1)
01	14/12/10	ACTIVATION	PRE	VOIT FOLIO 1	(see folio 1)
00	14/12/10	ACTIVATION	PRE	VOIT FOLIO 1	(see folio 1)
REV.	DATE	NAME	DESIGNATION	DESIGNATION	
IF NOT SPECIFIED, USE GENERAL TOLERANCES IN ACCORDANCE WITH ISO 2768-MK					
MATERIAL N°					
SCALE					
F. MACHINE POLYVALENTE service cuve					
A. MULTIPURPOSE POT TENDING MACHINE					
PNEUMATICAL DIAGRAM					
DRAWN BY: HEODRIS					
CHECKED BY: HEODRIS					
DATE: 20/08/10					
SHEET 2 / 2					
A0 N° 1 JO 858 68					
REV.					
NET WEIGHT					

6.2 PNEUMATIC ADJUSTMENT VALUES

ECL Document reference code : 1-10-951-07 rev 01

1. CORRESPONDANCE BETWEEN PNEUMATIC & ELECTRICAL ITEMS

Pneumatic item	Electrical item
A1.1	CU-M22
A1.10	CU-YV01
A1.13	CU-M23
A.1	CU-M21
A1.2	CU-TW21
A1.6	CU-PS01
A1.7	CU-TW02
A1.8	CU-TW01
A1.9	CU-YV02
A2.1	CU-M27
A2.10	CU-YV03
A2.13	CU-M28
A.2	CU-M26
A2.2	CU-TW26
A2.6	CU-PS02
A2.7	CU-TW04
A2.8	CU-TW03
A2.9	CU-YV04
A20a	CU-M24
A20b	CU-YV10
A20f	CU-PS03
A20e1	CU-YV12
A20e2	CU-YV14
A20g	CU-BT01

Pneumatic item	Electrical item
A20d	CU-YV13
A20c	CU-YV15
B3.a	LT-XV-01
B4.a	LT-XV-02
B5.a	LT-XV-03
B6.a	LT-XV-04
F.3a	TT-XV-01
F.4a	TT-XV-02
F.5a	TT-XV-03
F.6a	TT-XV-04
C2.a	TP1-XV-04
D4.a	HB-XV-03
G1.a	BP-XV-02
G2.a	BP-XV-01
H2.a	HB-XV-02
I2.a	HB-XV-01
J2.a	BK-XV-05
K1.a	EX1-XV-03
L4.a	EX1-XV-06
L5.a	EX1-XV-07
L6.a	EX1-XV-08
S1.a	SH-XV-05
S1.b	SH-XV-06
S3.a	SH-XV-07

2. PARTICULAR CONDITIONS

2.1. VARIOUS INFORMATIONS

Electrical motors (A1.2 & A2.2)

- Voltage : 460 V – 50 Hz
- Power : 55 kW
- Speed : 1460 rpm

Electrical motors (A1.1 & A2.1)

- Voltage : 460 V – 50 Hz
- Power : 0,25 kW
- Speed : 2800 rpm

Electrical motors (A1.13 & A2.13)

- Voltage : 460 V – 50 Hz
- Power : 1,85 kW
- Speed : 1460 rpm

Electrical motor (A20a)

- Voltage : 460 V – 50 Hz
- Power : 1,5 kW
- Speed : 1460 rpm

Solenoid valves (B3 to B6 ; F3 to F6 ; G1 ; G2 ; L4 to L6) type T 211

- Voltage : 24 V continuous
- Power : 8,6 W
- Current (holding) : 0.36 A

Solenoid valves (C2 ; I2 ; K1) type 6300

- Voltage : 24 V continuous
- Power : 8,5 W
- Current (inrush) 14,8 VA
- Current (holding) : 10,9 VA

Solenoid valves (D4 ; H2 ; J2 ; S1) type N3

- Voltage : 24 V continuous
- Power : 8 W
- Current (holding) : 0.33 VA

2.2. AIR COMPRESSED UNIT TYPE MS 880 L ECL

- Working pressure : 7,5 bars
- Working max pressure : 8 bars
- Nominal flow : 14700 l/mn (14.7m³/mn, 882 m³/h)
- Speed : 1460 Tr/mn – 50 Hz
- Power : 2x 55 kW (2 compressor groups M135F)
- Noise level : 78 dB
- Voltage : general 460 V/ 50 Hz (±10%)
- auxilliary 24 V continuous

3. PRESSURE ADJUSTMENT**3.1. TARING TABLE**

Description	Item	Code	Pressure adjustment			Note
			BAR		PSI	
Pressostat	A20f	0-00-242-48	5,5	MINI	79,8	Pressure minimum for a correct operation of tools
Pressure regulator	B2	1-10-486-76	2,4	FIXED	34,8	Decreased pressure for blowers
Pressure regulator	D3a	1-10-130-85	5	MAXI	72,5	Decreased pressure for filling tightness
Pressure regulator	E2	0-02-327-64	0,7 to 1	FIXED	10,2 to 14,5	Decreased pressure for beam air conditioning unit condensats pulverisation
Pressure regulator	F2	1-10-486-76	2,4		34,8	Decreased pressure for blowers
Pressure regulator	H5a	1-10-130-88	2	MAXI	29,0	Decreased pressure for hopper fluidization.
Pressure regulator	I6	1-10-040-80	0,5 to 0,8	MAXI	7,25 to 11,6	Decreased pressure for alumine measure fluidization.
Pressure regulator	K2a	1-10-119-07	2	MAXI	29,0	Decreased pressure in descent to limit load on connector

6.3 COMPRESSOR MS 840 L MANUAL

Location	ECL Code	Reference	Power	Pressure	Nominal flow
Main girder	1-10-872-64	MS 840 L	2 x 55 kw	7,5 bars	14700 l/min



MS 840 L

**WARNING**

If the MATTEI supplier handbook contradicts ECL handbook,
ECL informations get over MATTEI suppliers informations.



mattei®

AIR COMPRESSORS

MS 800 series



INSTRUCTION, USE AND
MAINTENANCE MANUAL
TIEHPG-208



mattei®

Forward



Voltages/Frequencies

- V 400/50 Hz

Standard: 3F + 

The hard copy of this manual will be available for more than 10 years after the end of production of the relative machine.

The content of this document cannot be used, reproduced or disclosed to third parties without the explicit written consent of **Ing. ENEA MATTEI S.p.A.**

Ing. ENEA MATTEI S.p.A. reserves the right to modify the characteristics of the machine subject of this document without prior notice.

Copyright 2008 by **Ing. ENEA MATTEI S.p.A.**

This Instruction Manual meets all the requirements of 98/37/EEC Directive.

It is to be considered valid for both the machines with CE Marking and those without it.

PED Directive (Directive on pressure equipment)

Components that are subject to the Directive 97/23/EEC on pressure equipment equal or higher than II Category

Description

Safety Valve

Separator

PED Categories

IV

II



General information

- Symbols in the manual Page 1.01
- Purpose of document Page 1.02
- Required qualifications for operators Page 1.03
- Manufacturer's identification data and location of the nameplate "CE MARKING" Page 1.04
- General notes on delivery - final inspection - safety precautions Page 1.05
- Settings to be made by customer Page 1.09
- Instructions on how to request interventions - Instruction on how to order spare parts - The manufacturer's address Page 1.10

General information - SAFETY

- Dangers, residual risks and general information Page 2.01
- Responsibilities Page 2.04
- Description of pictograms Page 2.05

Description of Machine

- General description of machine Page 3.01
- Technical data and overall dimensions Page 3.06

Transportation and handling

Installation

- Electrical connection Page 4.01
- Connection to the air distribution system Page 4.02
- Dimensions of compressed air distribution pipings Page 4.03
- Heat recovery Page 4.04
- Page 4.05

Safety devices

Use of compressor

- Foreword Page 6.01
- Operating mode: Modulation Page 6.02

Maintenance

- Periodic checks Page 7.01
- Check of oil level – cleaning and/or replacing the air intake filter - Page 7.02
- Cleaning the air/oil radiator - Cleaning and/or replacing the oil return valves Page 7.03
- Replacing the oil filter Page 7.04
- Replacing the oil/air separator elements Page 7.05
- Oil change Page 7.07

Lubricants

Troubleshooting

The electric motor

Storage – decommissioning and dismantling

Attachments :

- Form to request technical service
- Form to request spare parts
- Parts to be replaced during maintenance



Symbols in the manual

In this manual some symbols are used to attract the reader's attention and underline some particularly important aspects that are dealt with.

The table below gives the list and describes the meaning of the different symbols used.

SYMBOL

MEANING and NOTES



Danger

It indicates a danger with a risk for accident, even fatal, for the user.
Pay careful attention to text blocks with this symbol.



Warning

It warns against a possible deterioration of the machine or of the user's personal items.



Note

It shows a warning or note on the key functions or useful information.



Additional information

This symbol introduces text blocks containing further information.
Such information are not directly related to the description of a function or to the development of a procedure
They may be cross-references to other documents or other sections of this manual.



Risk of damage

Indicating a high risk of damage for an item, such as using a wrong tool or assembling something in the wrong way.



Visual check

Suggesting the reader to carry out a visual check. This symbol can be also found in the instructions for use. The user must read a measuring, check a signal, etc.



Acoustic check

It recommends the reader to carry out an acoustic check. This symbol can be also found in the instructions for use. The user is required to listen to an operational noise."



Purpose of Document

This manual includes technical characteristics, performance, transportation and installation rules, instructions for use, preventive and corrective maintenance operations of the machine manufactured by Ing. ENEA MATTEI S.p.A.



NOTE : This manual should be considered an integral part of the machine, and should stay with it during the whole life of the equipment.

Keep the manual and all attached documents in a place easily accessible to all staff in charge of the control or maintenance of the machine.

Ing. ENEA MATTEI S.p.A. reserves the right to subject the supply of further copies to the repayment of charges and to acceptance of special clauses related to the self-defense of intellectual property, patent, and executive and functional identity of the product and/or parts of it.

It is understood that passing on all or part of this manual to third parties is not allowed without prior written consent of Ing. ENEA MATTEI S.p.A., either texts, or illustrations or diagrams.

Ing. ENEA MATTEI S.p.A. reserves the right to make changes without prior notice. Any change, addition or elimination of machine elements, components, functions or cycles, not previously agreed upon with Ing. ENEA MATTEI S.p.A. releases the manufacturer from any responsibility whatsoever.

This manual is for the machine user and service engineer, and it aims at supplying them with typical system technical data, with a technical description of the various operating groups composing the same as well as the essential use procedures and information needed to perform preventive and corrective maintenance.

The manual is intended for staff with a sound knowledge of the machining processes, of mechanical and electrical diagrams, and involves both machine operators and technical service engineers

This manual is an integral part of the machine and contains information that aims at granting all staff safe working conditions and ensuring perfect efficiency during the whole life of the machine.

For a correct use of the machine it is assumed that the working environment complies with current regulations concerning safety and health.

Applied directives and technical standards

The machine has been designed, manufactured and tested in compliance with the "safety and health essential requirements" stated in attachment 1 to the **European Directive 98/37/CE**.

The list below gives the reference standards used by Ing. ENEA MATTEI S.p.A. for the design, manufacture and testing of the machine.

List of harmonized directives and technical standards

MACHINES DIRECTIVE 98/37/CE

ELECTROMAGNETIC COMPATIBILITY DIRECTIVE 2004/108/CE

LOW VOLTAGE DIRECTIVE 2006/95/CE

PED Directive (Directive on pressure equipment) Components that are subject to the Directive

97/23/EEC on pressure equipment equal or higher than II

EN 1012-1 Compressors and Vacuum Pumps – Safety Requirements - Compressors

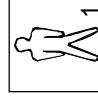


Required qualifications for operators

The person in charge of the machine operation or maintenance should have all specific professional skills to do this.

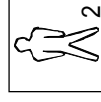
The operator should be trained and aware of his responsibilities.

Below is the description of professional profiles for the machine operators.



Entry Level Machine Operator (Qualification 1)

Qualified staff able to carry out simple tasks, i.e. to operate the machine by using push buttons on the control panel and carry out typical simple settings, start-up and stopping.



Second Level Machine Operator (Qualification 2)

Qualified staff able to perform the tasks of Qualification 1 and also to operate the machine with disconnected protections to perform settings, start-up or stopping functions.



Important

This qualification includes responsibilities that normally are divided into two separate qualifications. For our machine operators a training course is foreseen, enabling them to perform all needed actions to operate the machine even with some of the protections disconnected. However, this involves a certain competence by the operator and extreme care by the factory manager, so that the said operator performs only allowed operations.



Mechanical Service Engineer

A qualified engineer able to operate the machine under normal conditions, to operate it with disconnected protections, to work on mechanical parts and make all needed settings, maintenance and repairs.

He is not allowed to work on electrical systems with live voltage.



Electrical Service Engineer

A qualified engineer able to operate the machine under normal conditions and operate it with disconnected protections; he is in charge of all electrical adjustments, maintenance and repair.

He is able to operate inside cabins and shunt boxes with live voltage.



Manufacturer's Engineer

A qualified engineer from the manufacturer, to perform complex operations under special conditions or according to what agreed with the final user.



Manufacturer's identification data and location of the nameplate "CE MARKING"

Ing. ENEA MATTEI S.p.A. is identified as the machine's manufacturer, according to current laws in force, by following acts:

- Declaration of conformity - CE marking - Instruction manual

MODELLO (model)	
CODICE (code)	
N. SERIE - ANNO (S/n - year)	
PORTATA (flow rate)	m ³ /min
PRESS. NOM. - MAX. (design - max pressure)	bar
POTENZA NOMINALE kW (rated power)	
VEL. ROTAZIONE 1/min (rated speed)	
ESSICCATORE (drier)	
VOL. SERBATOIO (air receiver volume)	l
PESO (weight)	kg
ING. ENEA MATTEI S.p.A. 20060 VIMODRONE (MI) - ITALIA URL : http://www.matteiaircompressors.com	

A specific plate on the machine gives the following indeleible information on the **CE MARKING**:

- Model
- Code
- Serial number
- Year of manufacture
- Flow rate
- Pressure
- Power
- Rated speed
- Drier
- Receiver capacity
- Weight
- Manufacturer's name and address

The "CE MARKING" is applied on the machine electric starter.



The relevant "DECLARATION OF CONFORMITY" is enclosed. It is forbidden to remove the "CE MARKING" plate and/or exchange it with other plates of machines of the same model in use by the customer or the operator.

Should the "CE MARKING" plate be accidentally damaged or removed from the machine, customer should inform the company.

The compressor plate

In addition to the machine identification plate, a plate has been applied to the compressor that identifies its characteristics:

Note: The number next to the initials "CE, 1115," represents the id code of the Entity in charge of monitoring the compliance with Directive 97/23/EEC PED



General notes on delivery

Upon receipt of the machine please check that:
The supply complies with the order specification.
There are no damages due to transportation or other reasons.
(In the event of damage or missing parts, please inform immediately and in detail the forwarding agent or Ing. ENEA MATTEI S.p.A.)

ALWAYS STATE THE MACHINE SERIAL NUMBER AS WELL AS THE PRINT NUMBER OF THIS CATALOGUE WHEN MAKING ANY REQUEST TO Ing. ENEA MATTEI S.p.A. OR ONE OF THEIR SERVICE CENTRES.

Final inspection

The manufacturer carries out the final inspection of the machine directly, during the production phases, in compliance with the company quality system.

A certificate of conformity is supplied together with the machine.

Ing. ENEA MATTEI S.p.A. is responsible for the machine under its original configuration.

Ing. ENEA MATTEI S.p.A. refuses any responsibility for improper use of the machine, for damages due to operations which are not described in this manual or unreasonable jobs.

Safety precautions

The final user should comply with the instructions given by the seller, concerning:

- safety devices already installed on the machine
- instructions for correct machine installation
- correct use and periodic maintenance of all the machine components, including safety devices
- regulations of current laws

The following safety precautions define both the behaviour and obligations to be observed when carrying out the activities listed in the manual, the instructions for the machine use and the way how to operate under safety conditions, for the staff and the surrounding environment.

Machinery Directive

Machinery Directive means the DIRECTIVE OF THE EUROPEAN COMMUNITY COUNCIL 89/392/CEE dated 14th June 1989 and its subsequent amendments that modify its content 97/368/CEE dated 20th June 1991, 93/44/CEE dated 14th June 1993 and 93/68/CEE dated 22nd July 1993. In June 1998 the Machinery Directive and its subsequent amendments were included into Directive 98/37/CEE without modifications.

Machine

Machine means the functional assembly composed of: control unit, processing unit, working and resting equipment, systems (electrical, pneumatic, hydraulic, cooling, lubrication systems) and any group completing the system functionality.

Working area

Working area means the protected volume limited by guards to prevent injuries and aimed at operation during the machine processing.

**Authorized staff**

Authorized staff means personnel duly trained and appointed to perform the activities listed below and that make up the operating instructions for the machine.

Appointed staff

Appointed staff means the personnel who, although not participating materially in the work, supervise the work of others, for example the responsible engineer.

Transport

Transport means all those operations regarding the handling of the machinery or part of it

Installation

Installation means the mechanical, electrical and fluid system integration of the machine into a production reality, in compliance with specified requirements.

Commissioning

Commissioning means the functional check of the machine installed.

Operation

Operation means the operating mode at which the machine produces compressed air according to all settings and controls inserted by the control device.

Decommissioning

Decommissioning means to disconnect mechanically and electrically the machine from a production line.

Dismantling

Dismantling means dismantling and eliminating the machine components.

Maintenance and repair

Maintenance and repair means the regular check and/or replacement of parts or components of the machine and any action to identify the cause of failure, ending with the machine resetting to the design operating conditions.

Improper use

Improper use means using the machine out of the limits specified in the technical documentation.

Applicability

The regulations should be applied when performing following activities:

- Transport, installation and setting up
 - Manual operation
 - Continuous operation
 - Decommissioning and dismantling
 - Maintenance and repair
- that compose the use procedures foreseen for the machine.

**Installation and commissioning**

"The installation and commissioning are only permitted to authorised staff.

During installation, handle the machine components as indicated in this manual; if lifting is necessary, verify first the correct fixing of specific devices for lifting and use adequate slings and equipment.

The machine installation should be as free as possible from any material preventing or limiting its view. If there are any, remove fixing brackets or eyebolt blocking devices, previously fitted to allow the transport.

Check that all the machine safety devices are correctly fixed and there are no moving or loose parts. Also check soundness of the control unit components.

Connect the machine pneumatic system to the air distribution system and carefully check that pressure is set to the correct value.

Check consistency between the voltage set on power transformers and the voltage value of the electrical supply.

Before connecting the machine electrical system, check that the mains isolator is blocked in the open position.

Verify that accident preventing guards are correctly installed and in perfect state.

According to the different national law regulations, the Customer might be required to inform the Certified Authorities of the installation and set up and/or to undergo a system check if the machines are provided with tank (SPV) or pressure devices (PED).
Periodic inspections are also foreseen.



The machine safety is not guaranteed in case of removal, by-pass or tampering of the safety devices on the machine.

To stop the machine during an emergency, press the emergency stop button.

Operating the machine

Only authorised and duly trained staff or at least with a sufficient technical experience should operate the machine. The staff in charge of operating the system should be aware that the knowledge and application of safety regulations is in an integral part of their job.

Unskilled personnel should not access the operating area and the machine control panel when the system is live.

Before starting the machine, carry out following operations:



The machine is delivered empty.

The first oil charge has to be performed before starting the machine.

Please refer to section 7.07 of this manual, Maintenance-Oil change.

- Carefully read the technical documentation;
- Get information about the operation and position of emergency stop devices on the machine;
- Know which protections and safety devices are fitted on the machine, their position and operation.

It is forbidden to either disconnect or partially remove the protections and safety devices. The same applies for danger signals located in particular areas of the machine. It is strictly forbidden to access the working area and the control and power cabins during operation of the equipment (even partial) or immediately after it is switched off.

Protections and safety devices should be kept in perfect state so as to allow right operation; in case of failure they should be repaired or replaced.

The use of not authorised components and accessories for the protections and safety devices may lead to malfunctioning and dangerous situations for the operating staff.

Decommissioning and dismantling

Only authorised staff is allowed to decommission and remove the machine.

Before setting the machine out of operation it is necessary to disconnect the mains isolator and block it in the open position.

Discharge oils and fluids, remove all moving parts.

Disconnect the mains isolator cable, by cutting out the power wires and then the earth wire.

Disconnect the power supply cable from the machine main switch and remove it.

Disconnect the machine pneumatic equipment from the air distribution system.

Remove the machine from the working area following the instructions given in this manual. Before lifting it, verify the correct use of lifting devices and use only suitable equipment.

Waste disposal should be performed in compliance with the laws in force in the country where the machine is installed.

- ☐ Installation, setting up and use of compressor should be carried out in compliance with the standards and the rules in force concerning safety at work.
- ☐ The owner of the machine is responsible for its good maintenance, an essential condition to ensure safe operation.
Those machine parts that due to improper use or wear do not ensure safe operation should be quickly replaced.
- ☐ Only trained, authorised and skilled staff should perform the installation, use, maintenance and repairs.
- ☐ In case of difference between the instructions given in this manual and those foreseen by current laws concerning safety, it is recommended to apply the more restrictive ones.

Maintenance and repair

Only authorised personnel should carry out maintenance, troubleshooting and repairs.

Any maintenance and repair in progress should be signalled by a specific sign, stating the maintenance condition and placed on the control panel until completion of the job, even if temporarily interrupted.

All operations for installation, maintenance or replacement of components on the machine or on the control unit should be performed with switched off system.

Therefore, the main switch should be on OFF (OPEN) position and blocked with the safety lock to prevent any movement to the ON position.

For compressors equipped with INVERTER, before performing any maintenance job, wait at least 5 minutes after you have disconnected the electricity supply.

Before acting, people in charge of maintenance should first check following conditions:

- that any receiver under pressure has been exhausted.

Before intervening on pneumatic or lubricating systems and specifically on pipes, receivers, hoses and other components under pressure, the staff in charge of maintenance should reduce the internal pressure of the plant down to the ambient pressure value.

Faulty components must be replaced with others having the same code.

If during troubleshooting it is necessary to carry out jobs with the control unit and the machine live, all precautions should be taken, as required by the safety standards to operate under dangerous voltages and with moving parts.

At the end of the maintenance and troubleshooting jobs, all disconnected safety devices should be reset.

Maintenance, repair and troubleshooting should be ended by the checking of the machine operation and of all its safety devices.

Settings to be made by customer

The machine is delivered empty.

The first oil charge has to be performed before starting the machine.

Please refer to section 7.07 of this manual, Maintenance-Oil change.

Unless different contractual agreements are taken, the following items are normally at customer's expense:

- ☐ room preparation (including building works, such as foundations or canalizations, etc, if required);
- ☐ anti-slip, levelled flooring;
- ☐ observing the dimensions given in the layout drawing when preparing the site and when installing the machine itself;
- ☐ preparation of auxiliary services, suitable for the system requirements (such as electricity supply, pneumatic system, etc)
- ☐ preparation of the electrical equipment conforming to 2006/95/CEE Directive;
- ☐ adequate lighting complying with EN 60204-1 Standard;
- ☐ any safety devices upstream and downstream of the electrical supply lines (like differential switches, earthing systems, safety valves, etc) foreseen by the current laws in the country of installation;





For any kind of information on the use, maintenance, installation, etc. **Ing. ENEA MATTEI S.p.A.** is always available to meet the Purchaser's requests.

However, any enquiry should be made in clear terms, with references to this manual and always stating the data on the machine id plate.

For any communication with the service centre, always indicate the machine model, the serial number and year of manufacture, helping to identify every single machine and, when possible, specify the kind of problem or the defect found, for instance: electrical, mechanical fault or defects in the machining quality, and describe the same in the **"TECHNICAL SERVICE REQUEST FORM"** enclosed to this manual.

Please contact the nearest local service department, or refer to the headquarters in Italy.

Instructions on how to order spare parts

In the course of time a machine may need the replacement of those parts subject to wear.
The Purchaser may order the parts to be replaced.
It is compulsory to always buy original spare parts.

To order spare parts always indicate following data with the utmost accuracy:

- 1 Machine type and model
- 2 Serial number
- 3 Exact description of the item
- 4 Code and/or reference (if available)
- 5 Quantity

To simplify and speed up the delivery of spare parts, it is



To operate the machine under any operating condition, including maintenance, it is not necessary that more than one person be present.
Using more than one person is superfluous and, in any case, **not allowed for safety reasons.**



The employer should instruct the staff on the risks of accidents, on safety devices and on the general rules concerning prevention and protection, as established by the European Community Directives and by the current legislation in the country where the machine is installed.
The operator should be aware of the location and operation of all controls and of all the machine features.

The operator should also have read the entire manual.

Only skilled engineers should carry out maintenance jobs, after having duly prepared the machine.



Any unauthorized tampering or replacement of one or more parts of the machine, or the adoption of accessories that modify the use of the machine and the use of different materials than those recommended in this manual, may be a potential risk of accidents.

It is strictly forbidden for the machine to be operated by two persons contemporaneously, one inside the guards and one on the control panel.

Dangers and residual risks

During the design phase all hazardous areas have been considered and, therefore, all necessary precautions have been taken to avoid risks to people and damage to the machine components.

To guarantee both health and safety of those exposed, the machine is equipped with appropriate safety devices:

- **EMERGENCY** button to stop the machine immediately
- Fixed protections, located in areas with exclusive access for routine maintenance. They are fixed by devices that need special tools for their removal, or they are locked with screws.
- Protection and segregation of the electrical/electronic driving equipment of the machine by metallic box, to avoid accidental contacts with live equipment in case the metallic box is open; the electric box is IP 55 protected; IP 20 is the protection degree of the internal devices against accidental contact.
- Suitable panels or protection to cover moving parts.

Electrical devices to detect faults of the machine electrical supply and malfunction of motor electrical devices.



WARNING !!!

Every intervention has to be performed when the machine is COMPLETELY STOPPED.



WARNING !!!

When the machine is stopped, the electrical fans keep moving for a few seconds: Wait until they are COMPLETELY STEADY before opening the machine doors.



WARNING !!!

Our machine IS NOT SUITABLE for use in areas with potentially explosive atmosphere.





After having carefully considered all possible risks concerning the use and maintenance of the machine, all measures have been adopted to eliminate risks and limit dangers to exposed people.

Although the machine is equipped with safety devices, the following residual risks remain, which can be eliminated or reduced by the relevant precaution:

- Risk of bruises, tearing, cuts during the handling of tools and/or elements.
- Risk of bruises during machine intervention.

Operation

- ☐ **The operator should use the personal protection devices.**

- ☐ Use the compressor only for the kind of application for which it is designed (air compression for industrial use).

- ☐ Before starting, ensure that compressor is filled with oil.

- ☐ Please refer to Section 8 of this manual for the oil type to be used.

- ☐ Never operate the compressor if there is a possibility of inhaling smoke or toxic or flammable vapours.

- ☐ Never operate the compressor at higher pressures than those indicated in the id plate.

The air delivered by the compressor must not be used for breathing, although it is filtered and purified from oil.

- ☐ If hoses are used to distribute the air, ensure they are properly sized and suitable for the operating pressure, and not damaged or worn.

- ☐ Please remember that rubber hoses should be replaced at regular intervals.

- ☐ Never remove the oil filler plug when the machine is running or there is still pressure inside the compressor: there would be hot oil leak.

- ☐ Although it has an acceptable sound pressure level, the machine can produce a much higher noise if the room is narrow and reverberating. Please note that the continuous presence of an operator is unnecessary.

For safety against noise, in compliance with local laws in force, and if necessary, place specific warning signs near the machine and equip personnel with suitable protections.

Installation

Besides fulfilment of rules and regulations issued by the authorities, it is recommended to consider the following:

- ☐ The compressor will perform most efficiently if installed in a suitable, well ventilated area and far from heat sources.

- ☐ Should any duct be installed for the suction and cooling of air, always use the data and recommendations given in Section 4 and preferably obtain expert advice during the design stage.

- ☐ In case of outdoor installation (not suggested for very cold climates) it is necessary to place the machine under a roof or covering, to protect it against weather.

- ☐ Be careful that no foreign materials clog the radiator and cause rises of the operating temperature
- ☐ The intake air must be clean and free from flammable vapours, which could cause fires or explosions.

- ☐ As the machine is air cooled, except for machines supplied with the "Heat recovery" kit, adequate ventilation must be ensured to prevent it from overheating and thus avoiding the recirculation of the expelled hot air.

- ☐ Control and safety devices should never be tampered with.

- ☐ If one or more compressors are installed on a single pneumatic line, it is essential that each unit is equipped with a detect valve.

- ☐ Electrical connection should be conforming to current regulations. The machines should be earth connected and protected by a magneto-thermal switch against possible short circuits.

- ☐ It is essential to install a mains isolating switch upstream of the compressor.



Maintenance

The person responsible for operation of the compressor should check periodically that all instructions for operation and maintenance are followed by the operator.



WARNING !!

Fill in the specific "Maintenance Sheet" supplied with the machine.

Only trained staff should carry out maintenance, with the compressor off and with no pressure inside the same. Also disconnect the compressor from the pneumatic equipment.

Cut out the electricity supply by acting on the mains isolator located upstream of the compressor electric board and indicate with a special sign that the machine **MUST NOT BE RESTARTED**.



WARNING !!!

An adequate cleaning of both the machine and the place where it is installed is highly recommended.

For cleaning DO NOT USE flammable fluids or products not complying with current regulations.

In case of doubts about the compressor operation or of any of its components, it is recommended to contact the after sales service of Ing. Enea Mattei S.p.A.

The following should be also considered:

- ☐ Before intervening on the machine, disconnect the electrical supply by means of the mains isolator. In fact, the machine is equipped with an automatic start system, starting the same at any time, if required by the compressed air system.
 - ☐ The key for opening/closing the electric box doors should be given only to skilled personnel.
 - ☐ Maintenance operations should be always carried out with compressor not operating.
 - ☐ Before carrying out any job on the compressor unit, ensure through the gauge that there is no pressure inside.
 - ☐ Only use suitable tools for the kind of job.
 - ☐ Never use solvents and flammable products to clean the machine or individual parts.
 - ☐ Never carry out weldings or other jobs requiring considerable heat near the machine, specifically near the electrical system and the oil circuit.
 - ☐ Do not make modifications or weldings on vessels under pressure.
 - ☐ Do not leave tools, rags or other loose items on the motor or on the compressor.
 - ☐ The lubricating oil, especially if exhausted, may damage the skin: protect hands with gloves or specific protecting products for the skin.
 - ☐ Do not wear clothes contaminated by lubricating oil
 - ☐ Absolutely avoid contaminating the ground with lubricating oil.
 - ☐ To prevent pollution, store the exhausted lubricant into suitable containers and in a safe place. For oil disposal follow what suggested by internal rules and current regulations.
 - ☐ In case of topping up, use the same oil as already contained in the machine. Mixtures are harmful for both the oil and the compressor life.
 - ☐ After any maintenance, start the machine and check that all control, stop or alarm devices are working correctly; also verify that temperature and pressure values are the correct ones.
 - ☐ Make checks and overhauls as foreseen in this Manual, and use only original spare parts.
- Failing to make checks or using non original spare parts may cause problems that jeopardize the machine operation and the manufacturer's warranty will be no longer valid.

Responsibilities

Ing. Enea MATTEI S.p.A. refuses any responsibility for injuries to people, animals or damages to objects, caused by:

- ☐ non-observance of the mentioned precautions;
- ☐ improper use of compressed air or of the machine in general;
- ☐ non-observance of normal safety regulations or domestic rules in the work field;
- ☐ non-observance of the instructions during handling and transport of the machine;
- ☐ wrong machine installation;
- ☐ defects due to the electric power distribution;
- ☐ lacks in periodic maintenance;
- ☐ unauthorised jobs or modifications;
- ☐ use of non original or unsuitable spare parts for the involved model;
- ☐ non-observance of the instructions, even if only partially;
- ☐ possible inefficiencies caused by malfunction or non-use of the compressor



WARNING !!!

It is recommended to use the compressed air delivered directly by compressors only for manufacturing processes. For any other use, please ALWAYS CONTACT the distributor, the technical service or the manufacturer BEFORE HAND.



Description of Pictograms

Pictograms have been applied on the machine to explain following situations:

Danger
Obligation
Prohibition

Special indications (example: direction of rotation of the fan, etc)

Many accidents are often caused by the non-observance of the simplest safety rules or poor knowledge of the instructions given by the manufacturer.

To avoid possible danger situations, some of them are highlighted through special signs represented by suitable standardized symbols (pictograms).

Below is the list of the most common symbols applied to our machines:



Danger pictograms

These triangular signs are framed in black with a yellow background and the symbol is black.



Warning !

The machine is with remote control or with automatic system and may start without notice.



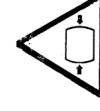
Warning !

Risk of high temperature surface (> 70 °C)



Warning !

Risk of electrical shock.



Warning !

Vessel under pressure.



Warning !

Air delivery.

Prohibition pictograms

These circular signs are framed in red, with white background and the symbol is black.



No working on the machine.



No pressure in the receiver.



No voltage.



Description of Pictograms

Obligation pictograms

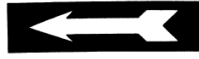
These are circular signs on a blue background, and the symbol is white.



Read the instructions manual before carrying out any operation on the machine.



Use individual protective means against noise.



Indication pictograms

These signs may vary in shape and they give useful information.

Direction of rotation.



Lifting point.

Possibility to carry out jobs.



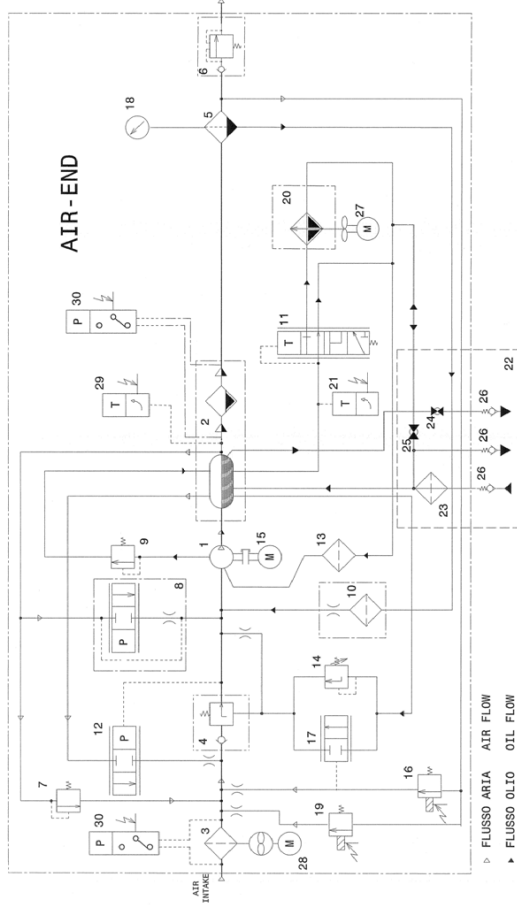
Combination of pictograms

The above shown combination of pictograms means:
Warning ! Please refer to the Instruction Manual before starting any activity.

Mattei rotary compressors are the result of over 80 years of investments in research and development, to improve performance continuously, and at the same time be environment-friendly. Designed for continuous industrial service, they guarantee constant performance over time, low energy consumptions, reliability, functionality and easy maintenance. The compressor is supplied complete with all components described below and equipped with optional devices.

For special requirements regarding lubricant, please refer to section 8 of this manual.

The shown devices can be "not all available" at the same time



1	COMPRESSORE ROTATIVO A PALETTE	1	ROTAIR VANE COMPRESSOR
2	CAMERA OLIO - SEPARATORE PRIMARIO	2	OIL CHAMBER - PRIMARY SEPARATOR
3	FILTRO ASPIRAZIONE	3	INTAKE FILTER
4	VALVOLA ASPIRAZIONE	4	INTAKE VALVE
5	SEPARATORE ARIA - OLIO	5	AIR - OIL SEPARATOR
6	VALVOLA DI MINIMA PRESSIONE E NON RITORNO	6	MINIMUM PRESSURE - NON RETURN VALVE
7	VALVOLA DI SFIATO	7	RELIEF VALVE
8	VALVOLA DI SOCCORSO A VUOTO	8	VACUUM RELIEF VALVE
9	VALVOLA DI SCARICO OLIO	9	OIL RELIEF VALVE
10	VALVOLA DI RITORNO OLIO	10	OIL RETURN VALVE
11	VALVOLA TERMOSTATICA BY-PASS	11	BY-PASS THERMOSTATIC VALVE
12	VALVOLA DI SCARICO PRESSIONE	12	PRESSURE EXHAUST VALVE
13	FILTRO OLIO	13	OIL FILTER
14	SERVOVALVOLA	14	SERVOVALVE
15	MOTORE PRINCIPALE	15	MAIN MOTOR
16	ELETTROVALVOLA DI MESSA A VUOTO	16	OFF LOAD SOLENOID VALVE
17	VALVOLA DI MESSA A VUOTO	17	OFF LOAD VALVE
18	INDICATORE DI PRESSIONE	18	PRESSURE GAUGE
19	ELETTROVALVOLA DI MESSA A VUOTO RAPIDO	19	FAST OFF LOAD SOLENOID VALVE
20	REFRIGERANTE OLIO	20	OIL COOLER
21	SONDA DI TEMPERATURA OLIO	21	OIL TEMPERATURE SENSOR
22	SISTEMA "PUSH-PULL"	22	"PUSH-PULL" SYSTEM
23	FILTRO CARICAMENTO OLIO	23	OIL FIL UP FILTER
24	RUBINETTO DI "TROPO PIENO"	24	EXCEEDING LEVEL TAP
25	RUBINETTO SCARICO OLIO RADIATORE	25	DRAIN TAP
26	ATTACCO RAPIDO SISTEMA "PUSH-PULL"	26	"PUSH-PULL" SYSTEM FAST COUPLING
27	ELETTROVENTILATORE RAFFREDDAMENTO	27	COOLING FAN AND MOTOR
28	ELETTROVENTILATORE PRE FILTRO	28	PRE FILTER FAN AND MOTOR
29	SONDA DI TEMPERATURA COMPRESSORE	29	COMPRESSOR TEMPERATURE SENSOR
30	INDICATORE DI INTASAMENTO	30	CLOGGING INDICATOR



All components are enclosed in a soundproofing canopy in sheet steel, epoxy powder painted and lined with deadening fire-resistant material.

The canopy has a pre-filter to prevent intake of gross particles that might prematurely clog the radiators and air filter.

Wide detachable panels and hinged doors allow easy access for all.

The base has openings to allow easy lifting and handling of the compressor (See Section 4).

Standard packing includes: fixing on wooden pallets, protective polythene cover, and a cardboard box.



Compressor

The vane compressor is a volumetric rotary compressor.

It consists of a cylinder (stator) in which a rotor, mounted eccentrically and tangential with it rotates, and two end covers.

The rotor has longitudinal slots in which the vanes slide. The vanes are pushed against the stator by centrifugal force.

Sealing of the moving parts, cooling and lubrication are provided by an efficient injection of oil through proper ports, due to the pressure difference between the compression chamber and the oil receiver. No pump for fluid circulation is needed.

An oil film on the inner surface of the stator prevents direct contact of the moving parts and avoids any wear.

In the vane compressor there are no axial thrusts pushing the rotor against the end covers.

Therefore there is no need for thrust bearings.

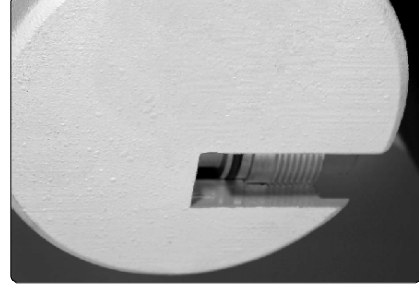
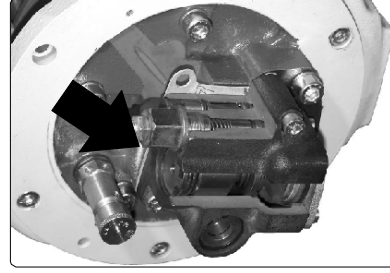
The rotor is supported by white metal bearings having a practically unlimited lifetime.

The air drawn in first passes through a filter and then through the modulating valve.

The decrease in volume of the pockets formed by the stator, rotor and vanes produces a continuous, pulse-free, compression.

Intake valve

The intake valve, driven by a specific servovalve through a hydraulic circuit using the same oil as used for lubrication, adjusts the intake air quantity to the air system requirements.



Minimum pressure and non return valve

Compressed air is delivered by the compressor through a valve ensuring a minimum pressure inside the oil chamber, so as to guarantee smooth operation when the compressor is delivering air. This valve also prevents the compressed air in the system from returning to the compressor.

Oil separation

The air/oil separation occurs in different stages and ensures exceptionally low oil consumptions.

The main mechanical separation occurs in the oil chamber through a labyrinth path.

This mechanical separation works via the continuous changes of direction of the air flow in the labyrinth path.

The last separation occurs through the coalescing filter, removing the remaining oil vapours from the air.

This particular oil separation system brings to a very reduced oil consumption. The large size of the filter and quality of materials ensure a long life of the filter itself.

Electric Motor

The compressor and the motor are connected by means of flexible coupling. This ensures a perfect alignment, no power absorption, silent operation and no need for maintenance.

The electric motor is asynchronous, threephase, 4 poles, with short circuit winding.

- Class F isolation
- High Efficiency Class
- IP 55 protection degree
- Power supply according to IEC 38 standard.
- Voltage/Frequency V 400/50 Hz - V 460/60 Hz

Cooling Systems

The compressor comes with two aluminium radiators and suitable for cooling oil and compressed air, respectively.

An airflow, output from the fan inside the sound proof cabin, comes into contact with the radiators and removes the heat generated during compression.

The temperature of the output compressed air is slightly higher than the environmental temperature.

See technical characteristics attached.



Connection boxes

The protection class is IP 55.

Electric diagram inside the auxiliary connection box.

Final Separator

The separator forms an integral part of the compressor, hence the latter should be used and operated within the specified limits as indicated on the technical data plate, and, specifically, in the installation, use, and maintenance guide.

Please refer to this guide for all necessary information.

During the compressor operation, the separator may contain oil that is gradually separated from the air before being re-suctioned.

The maximum operating pressure and temperature of this separator are indicated on its surface or on the applied plate.

The setting of the safety valve guarantees the maximum tolerated operating pressure.

Inspections during its running might be required by the different national laws.

DOCUMENTATION

The machine comes complete with:

- 1 Use and Maintenance Manual complying with Machinery directive 98/37 CE
- 1 CE Declaration of conformity
- 1 Start Report
- 1 Conformity Certificate
- 1 Maintenance Sheet
- 1 Electrical Diagram (inside the control board)

CERTIFICATIONS

Ing. Enea Mattei SpA has its company quality system certified according to standard UNI EN ISO 9001 by DNV while the final inspection procedures comply with standard ISO 1217 and have been certified by TUV.

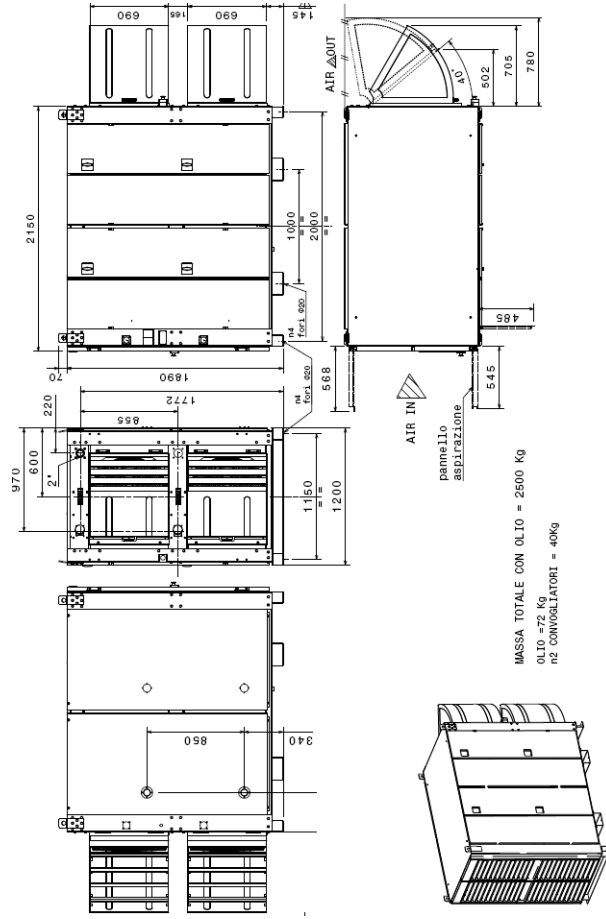


Location of main components

- 1 - Compressor
- 2 - Air Intake filter
- 3 - Motor connection box
- 4 - Oil Cooler
- 5 - Oil Chamber
- 6 - Final Oil Separator
- 7 - Load oil filter
- 8 - Level meter
- 9 - Oil filter
- 10 - Main motor
- 11 - Push-pull system
- 12 - Thermostatic valve
- 13 - Scavenge fan



Technical Data and Overall Dimensions



The whole area for the machine handling, including the space between the parking area for transport means and the machine installing area should be identified and inspected beforehand, to find any possible "DANGEROUS AREAS".

Be careful when handling, lifting and transporting the machine, not to damage it and not to damage things or cause injuries to persons.

For this purpose:

- ❑ Verify the total mass of the machine and use a forklift truck or an adequate lifting means. Specific pictograms indicate the lifting points.
 - ❑ The centre of gravity is near the coupling between motor and compressor; before lifting, check (lift the unit from the ground just slightly) that lifting points are correct and there is not risk of overturning.
 - ❑ When lifting, be careful not to damage the bearing structure (base) of the machine and the soundproof canopy.
- During the transport, carefully fix the machine to the means used, by blocking it lengthways and sideways.

It is recommended to protect the machine from atmospheric agents with suitable covering.

Unpack the machine by removing the guards and place it on the floor by means of a forklift truck to remove the pallet.

**Electrical connection**

Only qualified personnel should make the electrical connections, in compliance with current regulations.

WARNING !!!

For safe maintenance of all compressor components, including the electric starter, the customer should install a mains isolator and a magneto-thermal switch of suitable size as near as possible to the machine.



The mains isolator and magneto-thermal switch should be chosen by keeping into account the start features of the electric motor.

Adapting the size of wires between the mains isolator and the compressor starter should be made using the values given on the **"TECHNICAL DATA"** sheet.

All the machine auxiliary components are already connected to the start panel.

For further details, use the specific electrical diagram supplied with the machine.

WARNING !!!

Please note that the machine should be ALWAYS connected to the earth equipment.

**Connection to the air distribution system****Compressed air distribution**

Only qualified personnel should carry out the connection to the air distribution system, in compliance with the regulations in force.

The aim of distributing air is to bring compressed air from the machine to the end users, with the lowest pressure drop and energy waste.

To avoid losses and wastes, regularly check all pipings of the distribution equipment and all accessories. Filters, regulators and other accessories should undergo proper maintenance.



The connecting pipe to the system should be flexible and with a diameter not lower than the pipe leaving the machine.

A detect valve is required to isolate the machine from the air distribution system in case of maintenance.

WARNING !

The machine is equipped with a NON RETURN VALVE; if the detect valve is closed when the air distribution is operating some air under pressure could remain inside the connecting pipe !

Arrange a draining system for the piece of piping between the compressor and the detect valve.

In case there is the need to disconnect the machine, ensure that the internal pressure is exhausted before the dismantling procedure.

Near the machine, derive a flexible hose from the distribution system and connect it to a blowing gun: it is needed for periodic cleaning of the radiator, the intake filter and all other machine components.

The air drawn in by compressors contains, in a variable quantity and depending on the ambient conditions, a certain quantity of water indicated as relative humidity.

After air has been compressed, it is cooled in a specific radiator, which all versions of the Mettei compressors are supplied with.

Cooling air produces condensate of a good quantity of the water it contains.

The condensate produced is separated and drained with an automatic device (optional).

Please note that condensate should be collected and eliminated in compliance with current law s.

Dimensions of compressed air distribution pipings

We mention that the main causes for wastes are pipings with unsuitable diameter and losses due to an improper setting up of the equipment or deteriorated materials.

The pipe diameter must be duly selected so as to minimize the pressure drop between the compressor or the storage receiver and the point of use, based on the machine features, like air delivery and working pressure.

The pressure drop is proportional to the pipe length and most losses occur during the change of direction (curves, elbows) and in the valves.

With a pipe having the same diameter as the compressor outlet, the length should not exceed 50 m.

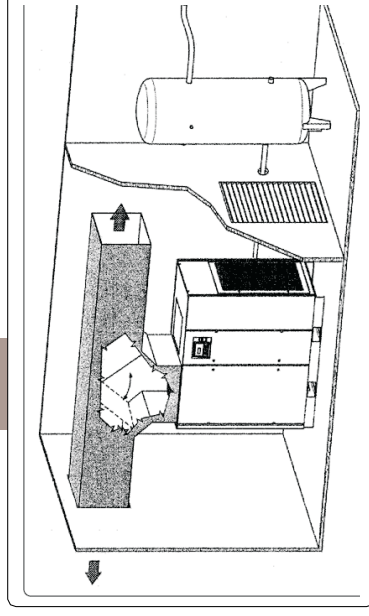
To make a check of one's own equipment, "Table 1" gives the load losses, over 100 metres straight piping, according to nominal diameters usually employed and at different air delivery and working pressure conditions.

A perfect air distribution system should limit the pressure drop from compressor to the point of use within few tenths of bar.

Table 1 – Load losses (bar) over 100 m straight piping

Pipe Diameter	Free Air Delivery [m ³ /min]	PRESSURE [bar]									
		6	7	8	9	10					
1"	1	0,087	0,076	0,068	0,061	0,056	2"	4	0,038	0,033	0,030
	2	0,315	0,275	0,245	0,220	0,200		8	0,138	0,120	0,107
	3	0,666	0,583	0,518	0,467	0,424		16	0,496	0,434	0,386
	4	1,134	0,993	0,883	0,795	0,722		24	1,050	0,919	0,817
2"	4	0,038	0,033	0,030	0,027	0,024	3"	8	0,019	0,017	0,015
	8	0,138	0,120	0,107	0,096	0,088		16	0,069	0,060	0,054
	16	0,496	0,434	0,386	0,347	0,316		32	0,248	0,217	0,193
	24	1,050	0,919	0,817	0,735	0,669		64	0,894	0,783	0,696
3"	8	0,019	0,017	0,015	0,013	0,011	4"	16	0,018	0,015	0,014
	16	0,069	0,060	0,054	0,048	0,044		32	0,064	0,056	0,050
	32	0,248	0,217	0,193	0,174	0,158		64	0,230	0,201	0,179
	64	0,894	0,783	0,696	0,626	0,570		128	0,829	0,725	0,645

Heat Recovery



As mentioned in above section on Page 3.03, a fan produces an airflow that cools both the oil and the compressed air, heating up when it goes through the radiator.

The recoverable heat represents about 100% of the power installed in MS 800 machines.

The heat produced can be conveniently recovered and used to heat rooms.

Any duct should be adequately sized and, if necessary, shaped in such a way to allow for a correct use during Winter and the output of hot air during Summer.

The duct to recover/output hot air should be designed by a competent engineer and should limit the load loss at approximately 20 Pa.

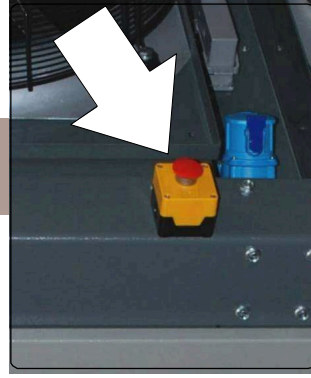
If the duct offers greater resistance, an auxiliary extractor should be used to prevent any overheating of the machine.

As an example, a duct with a higher or equal section to the coming out of the machine (the output grid on those versions equipped with a soundproof case), made up of some 10 m of straight duct and two 90° elbows properly connected, allows the maximum tolerated limits to be maintained.

However, it should be noted that 10 Pa increase corresponds to some 2-3 °C increase in operating temperatures.

As for the recoverable heat, it should be noted that 1 kW of installed power allows for the heating up a volume of about 30 cubic meters by 1 K (1 kW = 860 kcal/h).

In the Section on "TECHNICAL DATA" attached to this manual the values required to realize that which is mentioned above are indicated.

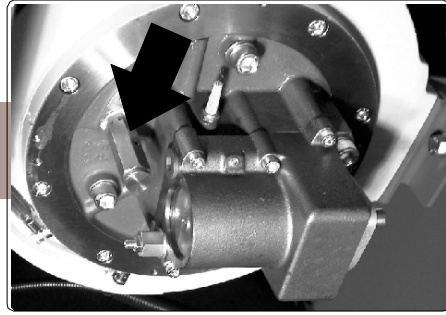


EMERGENCY - STOP button

The machine stops immediately when the button is pressed.



This button is to be used also in an emergency situation.
Frequent stops of the compressor by means of this button **may damage its operation**.



Safety Valve

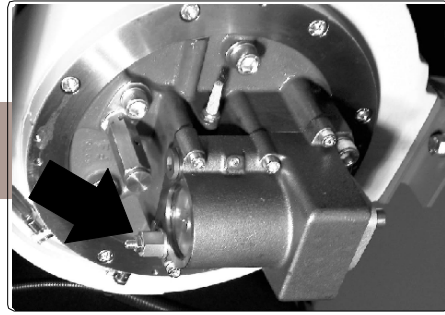
A "SAFETY VALVE" protects the compressor in case of air overpressure inside the chamber, while limiting the value to its own setting limit.

The safety valve is set at 12 bar for L and H version of compressors and 15 bar for HH versions.

Servovalve

MS 800 compressors keep the modulation and off load functions by means of a "SERVOVALVE". This servovalve limits the maximum operating pressure by acting on the intake valve, which closes as the internal pressure increases.

The maximum operating pressure is set at its optimal value during the final inspection and DOES NOT require any further adjustments.



Setting the Servo Valve Maximum Pressures

Version	L	H
Servo valves	7 bar	10 bar



Note

Compressor operation depends on the set values; it is suggested to ask for modification of settings only in case of real need and with knowledge.

Only skilled personnel should make the setting.

WARNING !!!

DO NOT set the servovalve at HIGHER values than those used by the manufacturer, Ing. Enea Mattei S.p.A. In fact, if the machine works at higher pressures it requires more power; this could lead to overheating and machine shutdown.



Foreword

The user should appoint a qualified person for operation and maintenance of the machine.

He should properly train all operators, so that they are acquainted with all needed measures to prevent any accident or injury to people.

All start and stop procedures as well as emergency ones should be known; they should be also periodically checked with the operators.

The operating and maintenance manual should be always available; in case of loss or damage, further copies can be purchased from Mattei's sales organisation.

Checks before start

Before starting the machine, ensure that:

the electrical system complies with voltage and power of the machine and that wires are of suitable section;

the machine is earth connected and protected against possible short circuits;

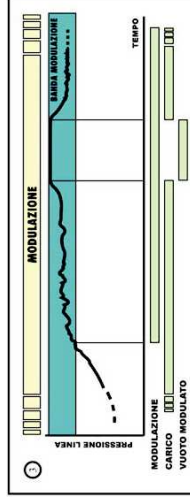
the mains isolator is installed near the machine;

the machine oil level is correct; with the compressor not operating and without pressure inside the chamber the oil should exceed the visual level indicator. In case of low level, top up with suitable oil of the same type as in use;

the machine is connected to the compressed air system.



Operating mode: Modulation



As an alternative to the operation modes described before, a typical feature of MATTEI rotary compressors, can be selected which is called Modulation.

The compressor internal pressure partly depends on the line pressure and consequently on the air demand.

When this is low, or there is no demand the line pressure and the compressor internal pressure rise.

It is possible to set the pressure maximum value (Pservo) at which the compressor will run off load

This is done by setting the servovalve conveniently.

When the compressor works within a pressure range between (Pservo) and (Pservo-0.3 bar), the air delivery is partial (modulated) and becomes zero at Pservo.

Note

A value of ~ 0,3 bar is the typical operating range of the servovalve which drives the intake valve, from the completely open to the completely closed position.

This is called "Modulation range" and it is originally preset by ING. ENEA MATTEI S.p.A., however it may be suited to different operating conditions.

For further details, please contact to ING. ENEA MATTEI S.p.A.



Suggestions on maintenance

Machine cleaning

Cleaning of the equipment should be carried out at regular intervals, following the schedule in this manual.

To clean delicate parts of the machine direct the compressed air jet so that neither machining waste nor humidity can penetrate in the mechanic assemblies.

Only use lint-free cloths to clean internal and/or moving parts (in contact with lubricant).

Always use perfectly dry air during the cleaning and at suitable pressure to avoid injuries to the operator.

Maintenance schedule

The time intervals in the maintenance tables are only reference values concerning the machine operation at the company's conditions.

Environment factors affecting these intervals are mainly: machine environment (temperature, humidity) and air pollution.

Machine lubrication

Use only the lubricant quantity needed to lubricate the involved mechanism. Carefully dry the excess oil or grease with a cloth.

Sometimes an excess or a lack of lubricant may jeopardize the machine operation.

Only recommended lubricants or well known and tested equivalent lubricants should be used for lubrication

Replacement of the exhausted oils should be made when the machine is warm. The oil temperature should range between 25 and 30 °C. (see section 8).

The draining and filling holes should not be left open for more than the time needed to replace the oil.

Jobs to be performed during maintenance

During maintenance operations pay attention to all signs that may precede a failure, and specifically:

- presence of corrosion,
- presence of wear,
- presence of loose unions or connections,
- presence of oxidized contacts,
- after each maintenance operation, exhaust the air from the pneumatic pipings.

Minimizing downtimes after a failure

It should be noted that correctly performed maintenance interventions may minimize downtimes after a failure.

A repair made in due time prevents further deterioration.

Only use original spare parts and repair the damaged component thoroughly, by your factory or send it to the nearest authorised service centre.



**Regular Checks
WARNING !!!**



After the first 50 hours of operation and every 6 months or 3000 hours:
- tighten nuts and screws fixing the cables in the command and control electrical board and in the terminal board of electrical motors.



Within the first 500 hours of operation:
- clean the oil return valves (Page 7.03).

Oil change

See section 8 of this manual.

Replace the oil filter at every oil change.

Suggestions for maintenance:

Monthly (or every 500 hours)
- Check the oil level.
- Clean the intake filter.
- Clean the oil cooler.

Every 3 months (or every 1500 hours)
- Clean the oil return valves

Every 6 months (or every 3.000 hours)
- Replace the intake filter
- Tighten nuts and screws fixing the wires inside the start and control panel and inside the motor terminal board.
- Grease the motor bearings

Yearly (or every 6.000 hours)
- Replace the oil return valves



WARNING !!!

In dusty environments and/or at high temperatures maintenance operations should be carried out more frequently.

The manufacturing date is quoted on rubber hoses.

Their operating life is 3 years, after which they should be replaced.



WARNING !!!

Scheduled maintenance agreements are available, to help the user keeping the machines at best operating and efficiency conditions.

Please apply to **Ing. ENEA MATTEI S.p.A. / M.T.A.** for further details.



WARNING !!!

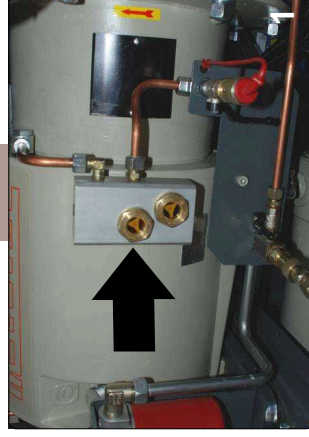
For compressors equipped with INVERTER, before performing any maintenance job, wait at least 5 minutes after you have disconnected the electricity supply.



Check of oil level (Photo 1)

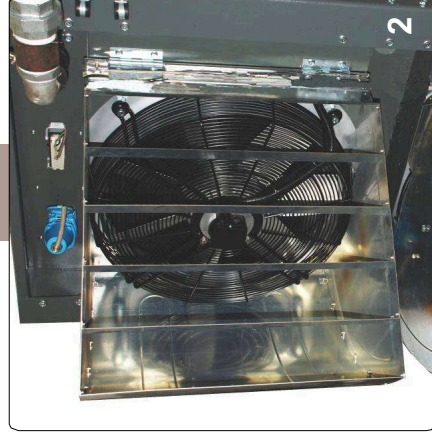
With compressor not operating and without pressure inside the chamber the oil level should exceed the upper oil level indicator.

When the compressor is running and on load, the oil level should reach half the upper level indicator.



Cleaning and/or replacing the air intake filter
Release the lock knob and remove the seal and the cover; take out the filtering element; clean the element with compressed air, directing the jet from inwards to outwards.

Thoroughly clean also the filter housing and cover.
Refit all items in reverse order.
Check the gasket and replace it if damaged.



Cleaning the oil radiator (Photo 2)

The cooler is located inside the machine canopy. Considering the compressor cleaning airflow, an air current flowing from inside to outside crosses the radiator.

Hence, dust will mainly deposit on the inner part. To clean, proceed by opening the specific door and blowing the radiator with a compressed air flow.

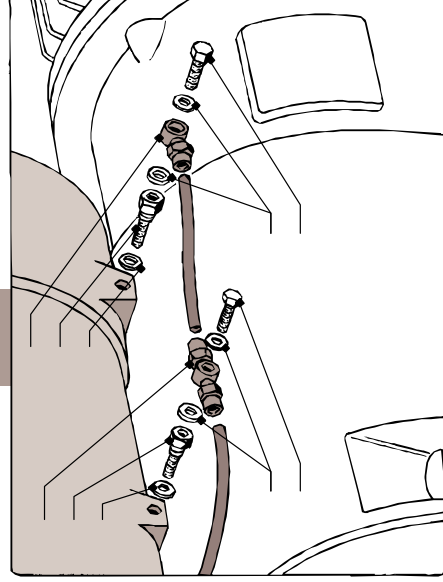


Cleaning and/or replacing the oil return valves

Unscrew the drilled screws (1) locking the oil return flexible pipe unions (2).

Be careful not to lose the seal washers (3); unscrew and take out the oil return valves (4); wash the valves with detergent and then blow them with compressed air; replace the sintered filter if it is very scaled.

Always replace the O rings (5) when reassembling and proceed in the reverse order.





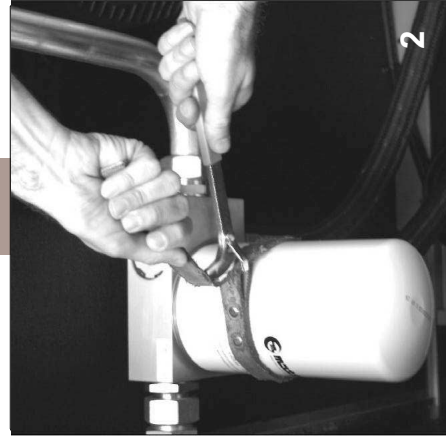
Replacing the oil filter

Replace the oil filter every time the oil is changed.

Do not discharge the oil from the machine to replace the filter. Just wait for a few seconds after the last stop to enable the oil in the tubes to flow.

Proceed as follows:

- unscrew the filter cartridge
- clean the seat;
- wet the gasket of the new cartridge with oil and screw it (Photo 2).



Replacing the air-oil separators

Under normal operating conditions the separator element should be replaced if an excessive oil consumption occurs, or in case of a high pressure drop through the same.

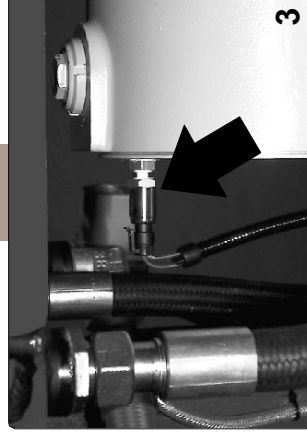
To perform this operation, proceed as shown in the subsequent photos regardless of the kind of fan used:

- Remove the rear panel (separator side)
- Remove the connector of the off load solenoid valve, mounted on the rear part of the separator, and remove the relevant air delivery tube (Photo 1).
- Remove also the pressure sensor, the PT 1000 sensor and the temperature probe (Photo 1).
- Proceed as described on Page 7.04 and remove the small pipes of the oil return valves (Photo 2). Remove the pressure sensor. (Photo 3)

Loosen the ring nut (Photo 4) of the holed screw fixing the separator body to the oil chamber.

Note the position of the reference notch of the holed screw (Photos 5 - 6) as in the subsequent assembly it should be positioned in the same way. Withdraw the separator body, translating it parallel to itself, through the rear opening.

Now replace the filtering elements.



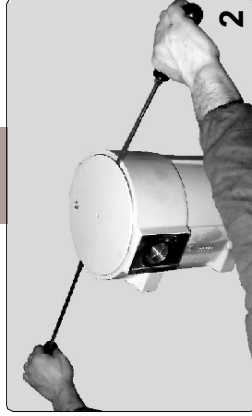


Replacing the air-oil separators

Withdraw the separator (Photo 1) as described in Page 7.05.

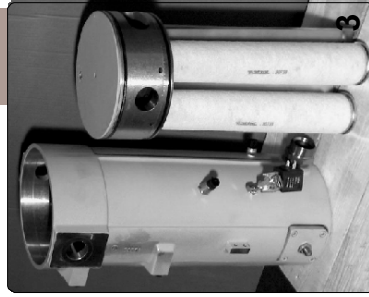


- Remove the cover (Photo 2 and Photo 3) to which the separators are fixed while prizing with two suitable tools in the cover round groove and noting the position of the separators. Unscrew the blocking nuts (Photo 4), remove the sealing washers, the covers and the separator with related OR-Rings (Photo 5). Note the position of both the guard (Photo 4) and the related supports.



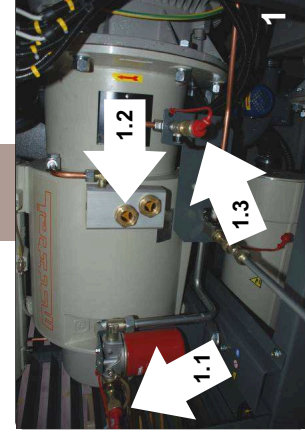
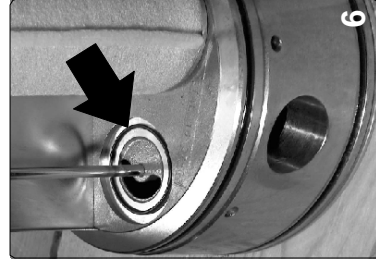
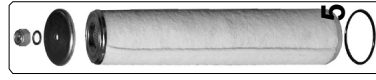
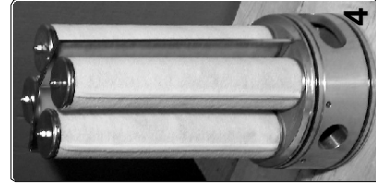
Replace the separator (Photo 5). Replace all of the sealing rings (OR-Ring). Re-assemble the various parts, while specifically taking care that the OR-Rings (Photo 6) are perfectly positioned in their corresponding housings.

Using a small quantity of grease can help keep them positioned during mounting.



Important : the holed screw (Photo 7) should be re-placed with its notch turned in the correct direction.

The operation is the same if the compressor has a centrifugal or axial fan.



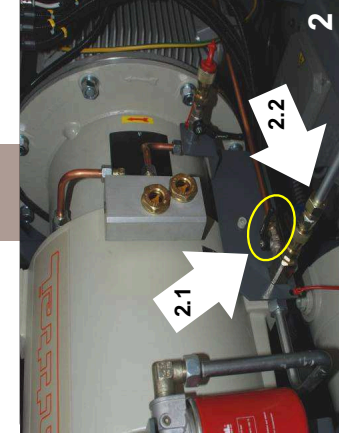
Foreword

As mentioned before, the oil performs many essential functions for compressor operation and, consequently, it is important to check its quantity and conditions at the suggested times.



The compressors are delivered empty. The first oil fill up has to be performed before starting the machine.

Always VERIFY THE CLOSURE of the drain tap and of the exceeding-level tap before starting the compressors.



Note

The nominal oil level of each compressor is about 35 liters.

Oil fill up

With the compressor not operating, connect the oil fill up and the exceeding-level couplings (1.1 and 1.3 in Fig. 1).

Open the exceeding-level tap (3.2 in Fig. 3). Fill the machine until the oil reaches the top of the upper level indicator (1.2 in Fig. 1) and **close** the exceeding-level tap.

Start the compressor and let it operate for few minutes, then stop it and verify the correct level by means of the specific indicator.

Top up if necessary. Open the exceeding-level tap and drain the oil if necessary. **Close** the exceeding-level tap.

Repeat the previous operations for the second compressor.

Oil change or oil supplement

It should be noted that exhausted oil is dangerous for operation of the compressor and, therefore, it should be replaced when the change interval has expired.

The oil should be replaced and topped up by means of the **push-pull** system:

- Connect the oil fill up coupling (1.1 in Fig. 1) (and the oil drain coupling (2.2 in Fig. 2) in case of oil change).
- In case of oil change, move to the open position the drain tap (3.1 in Fig. 3).
- In case of oil supplement, move to the open position the exceeding-level tap (3.2 in Fig. 3).
- Start filling the compressor (and draining in case of oil change) until the correct amount of oil has been loaded.
- In case of oil change, move back to the **close** position the drain tap (2.1 in Fig. 2).
- In case of oil supplement, move back to the **close** position the exceeding-level tap (3.2 in Fig. 3).
- Verify the correct level by means of the specific indicator.

Repeat the previous operations for the second compressor.

Position of the taps during each operation:

	Drain tap	Exceeding-level tap
Oil fill up	Open	Open
Oil change	Open	Closed
Oil supplement	Closed	Open
Working	Closed	Closed



Lubricants are flammable products.

Observe the indications given on the containers !

During the disposal of exhausted lubricants it is necessary to comply with following environment protection rules:

- Lubricants may contaminate water and soil !
- Never pour lubricants on the ground, into water, or in the sewerage system.
- Any infringement of these rules can be legally prosecuted! When handling lubricants keep an oil agglomerative base near the working area.
- Recover the exhausted lubricants while separating the mineral based from synthetic lubricants. Upon disposal, please comply with current regulations concerning the disposal of exhausted oils.

Only the use of lubricants with suitable quality guarantees a safe operation of the machine.

It is forbidden to mix lubricants of a different quality, as their composition and additives are not the same.

This rule should be mainly applied to synthetic and mineral lubricant mixtures.

If other lubricants are to be used, it should be verified beforehand if the two products are compatible. In case of doubts, the lubricant used up to that moment should be completely eliminated, by means of a washing procedure of the fluid circuit.

To avoid any risk of contamination, the lubrication procedures should be carried out under "absolute cleanliness" conditions.

All manufacturers of lubricants mentioned in the table offer a technical information service that may answer all your questions on lubrication.

WARNING on lubricants

The correct use of suitable lubricants considerably helps to obtain the maximum performance and the elimination of failures.

During the handling of lubricants on equipments, it is essential to strictly comply with the following precautions, for sanitary protection:

- Avoid any prolonged, excessive or repeated contact of the skin with lubricating products as well as avoid inhalation of their vapours or fumes.
- Wear suitable clothing and protections to protect the skin (for instance overalls, eyeglasses or, as far as allowed by the safety rules, protection gloves) or apply a protective product.
- Clean dirty skin carefully by abundantly washing it with water and soap.
- Apply a skin cream after washing.
- Take out and change clothes and shoes soaked with oil.
- Never put oil soaked clothes in one's pockets.



General

Several oils are available on the market and research continuously improves their characteristics and it changes the names and specifications.

When the warranty period is over, during which the use of Mattei Robroil lubricant is compulsory, the user can decide to use the oil he believes most suitable or the available one, provided it is suitable for rotary vane compressors.

Only manufacturers of lubricants can recommend the most suitable oil for the kind of machine and for its specific application.

The user should then purchase the lubricant from an oil company or a distributor that guarantees its suitability for the specific use.

The cost of the best lubricant is a small percentage of the total running cost of the machine: it is suggested to purchase the best available on the market (see the section **"MATTEI LUBRICANTS"**).

Please consider that in lubricated and injection cooled compressors the oil performs the listed tasks and it is subject to continuous working cycles; therefore, it should be highly resistant to oxidation to ensure long life.

The oil should also provide a good demulsivity.

Anti-oxidizing additives should provide low volatile substances at the compressor operating temperatures, so as to ensure protection between one oil filling and the other.

The user must adopt the kind of oil grade recommended by Mattei.

Please refer to the specific table for the choice, according to the operating conditions.

Available oils on the market

There are several kinds of oils on the market, including:

- ☐ mineral based industrial oils;
- ☐ synthetic oils.

Mineral based industrial oils

These oils have been designed for different applications and also for some types of compressors.

In this case, too, there are standards specifying their features; please refer to DIN 51506 which classifies the oils as VB-L, VC-L e VD-L, according to their possibility of working at different temperatures.

The latter is suitable for high temperatures and it is resistant to oxidation caused by the continuous mixing with the air.

ISO 6743-3A classifies oils based on the operating temperature and pressure and, according to this rule, for rotary vane compressors ISO-L-DAH o DAJ oils are recommended, which are for medium and heavy applications.

The table indicates some typical values of the main characteristics."

Typical features of Industrial Oils	Measuring unit	Ambient temperature 5 ÷ 40	Ambient temperature -5 ÷ 30
Viscosity ISO VG	---	150	100
Viscosity at 40°	cSt	135 ÷ 165	90 ÷ 105
Viscosity at 100°	cSt	14 ÷ 16	10 ÷ 12
Viscosity Index		93 ÷ 100	100 ÷ 110
Pour point	°C	-10 ÷ -5	-15 ÷ -10
Flash point V.A.	°C	230 ÷ 265	250 ÷ 265
Volumes mass	Kg/m ³	880 ÷ 900	880 ÷ 900

Values in the Table are merely indicative



Synthetic oils

Many synthetic oils with different basis are available on the market (esters, glycols, etc) that sometimes have proved to be suitable and provide a longer life than mineral oils.

Normally they reduce carbon deposits, provide a high self-ignition temperature and are remarkably resistant to oxidation.

As synthetic lubricants are good detergents, to change the kind of lubricant in a machine and pass from a conventional mineral based to a synthetic one, it is necessary to carry out a thorough washing, following the supplier's instructions, to avoid damages to the machine if dirt, residues and deposits circulate. It is also necessary to pay attention to condensate, as usually synthetic lubricants are more sensitive to water washing and their thin film may not provide enough protection against rust.

This problem can be worsened if the compressor is not working continuously, but occasionally.

In this case, even though not suggesting its use, any responsibility for the choice is up to the user and to the lubricant supplier.

WARNING !!!

It is difficult to determine life of an oil, as there are different parameters affecting the same, among which the operating temperature and quality of the intake air are very important.



For this reason it is recommended to obtain precise guarantees from the supplier, validated by the analysis of samples taken from the machine, to determine the suitability of lubricant and its life.

MATTEI LUBRICANTS

Considering the important role of lubricant for operation of the compressor, Mattei offers special lubricants to the users and recommends their use.

These are:

- **Mattei Rotoroil 8000 F2 (synthetic),**
- **Mattei Rotoroil 8000 F4 (synthetic),**
- **Mattei Rotoroil 8000 FG (synthetic, non toxic)**

available in 2, 5 and 25 litres cans.

Their life can reach the hours shown in the table, depending on the operating temperature and conditions of the intake air.

MATTEI LUBRICANTS

Name	Ambient temperature	Operating hours (max.)
Rotoroil 8000 F2	From - 15° a + 45 °C	5000
Rotoroil 8000 F4	From - 30° a + 30 °C	5000
Rotoroil 8000 FG	From - 5° a + 40 °C	1000



Safety Precautions

There is a latent risk of fire in almost all compressed air systems and ISO 5388 Standard explains the reasons.

In fact, in compressed air systems both oxygen and oil are always present and are combustible. Should for any reason oil vapours form, these could burn in presence of a flame; an ignition source may start a fire in case of use of excessive or unsuitable oil, or when neglecting maintenance.

Faulty maintenance has been mentioned, because a dirty radiator may cause a temperature rise, often quickly, which leads to oil damage and to the creation of deposits.

Such processes are accelerated if unsuitable oil is used.

Based on experience, fires are almost never caused by the fact that the oil self-ignition temperature is reached (340-400 °C).

Usually the cause is that the oil, while decomposing, creates carbon residues that when in contact with air and high temperature, continue to oxidize and, under special conditions, may ignite. So it is essential to use suitable lubricants and carry out correct maintenance.

WARNING !!!



It is opportune that to prevent the risk of fires the best attention is given to the oil choice and to execution of all maintenance operations, and specifically:

- carry out regular and complete oil changes;
- ascertain that the cooling system is always efficient, with often checks to the oil temperature;
- verify that protecting devices installed are always in perfect working order;
- keep the oil consumption under control;
- take care of the machine cleaning.

Storage and treatment of oils

Usually lubricant containers are built so as to prevent any contamination.

When the user receives the lubricant, it is under his responsibility to avoid damages or pollution to the same.

The lubricant may get damaged due to:

- dust and dirt;
- condensate, mainly due to absorbing humidity from the air;
- extreme temperatures;
- mixing with other oil types.

Please note that dirt in the oil reduces its efficiency and causes wear of those parts it comes into contact with, therefore there is the need to increase maintenance.

Instead, condensate cancels the effect of some additives, often present in very limited quantities. Oil containers should be stored in protected rooms, avoiding exposure to extreme temperatures.

WARNING !!!



**Absolutely avoid the mixing of oils of a different grade and quality .
Although looking alike, they could not be compatible.
Also beware of oil leaks, not only being a waste, but also polluting, causing falls or injuries to people and also fires.**



General

As mentioned in the section dedicated to protections, the command and control board controls the smooth operation of the compressor. It is possible that, due to the incorrect use of the machine, or incorrect maintenance or unforeseen conditions, etc., malfunctions occur and that only their effects are indicated. The table below aims at helping the operator solve some difficulties should they arise while indicating their possible causes.

Problem - Cause - Solution

Below some possible failures are indicated with their causes and how to identify the correct solution.

PROBLEM	CAUSE	SOLUTION
A. Start The Star/Delta commutation does not take function correctly	The electrical supply is not sufficient and the excessive voltage drop during the starting causes release of the contactor.	Check correct sizing of the electrical supply. Please refer to section 4 of the "Operating and maintenance manual". Contact the nearest authorised service centre.
The compressor does not start.	The line pressure is higher than Pmin. The pressure switch reads a wrong value.	Check the line pressure. Check proper operation of the pressure switch. Contact the nearest authorised service centre.
B. Pressure The system pressure does not reach the required value.	The servovalve has not been set correctly.	Verify the setting. Contact the nearest authorised service centre.
	The condensate drain solenoid valve is blocked in the open position (Optional kit separator/condensate drain).	Clean the specific filter to remove the cause of the block and then check operation.
	The minimum pressure valve does not operate properly.	Check operation. Contact the nearest authorised service centre.
	Clogged intake filter	Replace the filter. Refer to section 7 to the "Operating and maintenance manual".
	Request for air greater than the compressor maximum capacity.	Please refer to the Sales Organization of Ing. Enea Mattei S.p.A. to study equipment improvement.
The inside pressure exceeds the set value.	The servovalve is not set correctly.	Check the servovalve and its correct setting. Refer to sections 5 and 6 of the "Operating and maintenance manual".



PROBLEM

CAUSE

SOLUTION

C. Oil

Excessive oil consumption; the oil the level lowers too quickly; clogged; oil is detected inside the system.

The oil return valve filters are clogged.

Replace the filters and verify the causes of clogging.
(see section 7)

D. Temperature

The compressor stops due to its own over-heating.

The radiator or the cooling air filter are dirty; the ambient temperature is too high for compressor operation.

Replace the filters and verify the causes of clogging.
(see section 7)

The compressor stops due to motor overheating.

Excessive working pressure.

Check setting and bring it to the machine's setting value.

The motor cooling is not sufficient;
There is not enough air or it is too hot.

Verify the environmental conditions and the condition of the filtering panel.
(see Sections 3 and 7)



General

The electric motor characteristics are given on the nameplate fixed to the motor itself, and specifically:

1. Model
2. Serial number
3. Protection degree
4. Insulation class
5. Maximum ambient temperature
6. Service
7. Service factor
8. Supply voltage [V]
9. Frequency [Hz]
10. Speed [rpm 1]
11. Power [kW]
12. Power factor [cos φ]
13. Rated intensity [A]
14. Motor weight
15. Type of bearings (front and rear)

Lubrication

The same plate also indicates the type of bearings mounted, for which it is recommended to use lithium based grease for lubrication.

Greasing (where necessary) should be carried out when the motor is running.

The lubrication intervals should never be longer than the solar year.

Cooling

The motor is equipped with a cover and fan, to guarantee proper cooling. Check that dirt does not form on this cover as it could reduce the cooling air passage.

Abnormal noises

Any vibration or abnormal noise is usually due to deterioration of the bearings. In this case it is recommended to replace the bearings rather than risking more serious problems to the motor or the machine.

Electrical checks

If the machine has been stored for a long period or in case of long stops in damp places, it is suggested to measure the winding insulation value by applying 500 V d.c. voltage for 60 seconds.

The insulation should be at least 10 MΩ (MegaOhms) in warm conditions or 100 MΩ in cold conditions. Should these values not be detected and in case the motor has been exposed to damp, it is suggested to dry it for 24 hours in a furnace at 100-110 °C.

If no furnaces are available, please contact the manufacturer.



WARNING !!!

Before starting the machine, verify that the nuts locking the terminals of the power supply wires are well tightened.



Storage

The compressor is protected against corrosion and deterioration for the shipment period and for a relatively short period of storage (3 months).

For longer periods please contact the manufacturer considering it can be maximum time 24 months.

In any case it is suitable to keep the machine in a dry place, protected against atmospheric agents.

In wet climates, to protect the electrical and mechanic components the machine should be kept in a heated room or closed in a barrier- bag with heaters or light bulbs.

Specifically for the motor, please refer to what mentioned about the winding insulation.

Decommissioning

Decommissioning the machine does not involve any special precautions, only collection of the oil contained in the machine and components of the lubrication system, like the oil filter and the oil-air separators.

WARNING !!!



Both these elements and the oil should be collected and dumped in compliance with the current regulations on the environment in order to avoid any pollution and danger of fire.

Dismantling

When the machine has reached the end of its technical and operating life, it can be demolished, i.e. decommissioned and put in such a condition so as not to be used any longer for the purposes it was designed and built, with the possible recycling of raw materials.

NOTE

Ing. ENEA MATTEI S.p.A. will not take any responsibility for damage to people or objects that may derive from the recycling of individual components of the machine, for operation or assembling situations different that the original ones.

Ing. ENEA MATTEI S.p.A. refuses any implicit or explicit acknowledgement of suitability to specific purposes of the machine components re-used after the final dismantling in view of its demolition.

WARNING

The deactivation and dismantling of the machine should be carried out only by duly trained and equipped staff.

Act as follows to deactivate the machine permanently:

- Drain the oil from the receiver.
- Disconnect the machine from the electrical and pneumatic supply systems
- Lift the machine with suitable lifting means.
- Disassemble the machine main components.
- Block all the machine moving parts.
- Take all the machine components in supervised dumps.

Residual risks after deactivation

After deactivating the machine, there are no residual risk if all moving parts have been duly blocked.

ID	-	Titolo	
Revision	-	MS 800 series	
Emitted	0	Date	04/07/2008
LdF	GF	Approved	

1 PREFACE

The following procedures describe the steps to be followed in order to disassemble the air-oil separator and the rotor-stator unit from the oil chamber of the MS 800 series units.

2 PROCEDURES

To perform these operations, we suggest to remove the complete MS 800 series units from the travelling crane and place them in a suitable working area.

It is not necessary to remove the air-oil separator before removing the rotor-stator unit.

To completely remove the rotor-stator unit, two different procedures can be followed according to the tools that will be used to move it. The steps can be identified by different prefixes: A for pallet truck and B for crane.

ID	-	Titolo	
Revision	-	MS 800 series	
Emitted	0	Date	04/07/2008

Air-oil separator

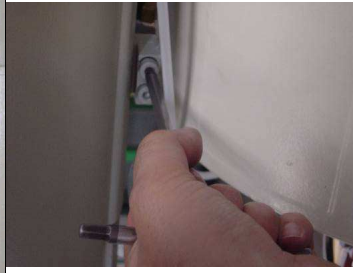
Step 1

Unscrew the ring nut on top of the air-oil separator.



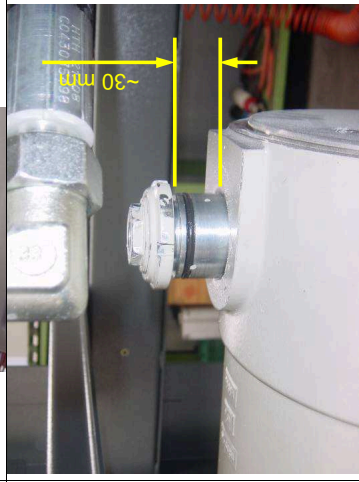
Step 2

Unscrew the two screws between the air-oil separator and the oil chamber.



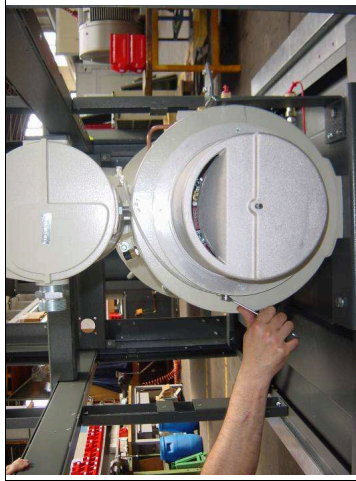
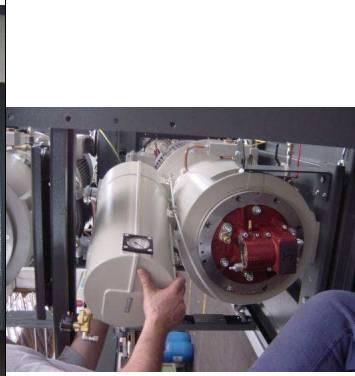

Step 3

Lift as shown in the side figure the screw on top of the air-oil separator (don't completely remove).




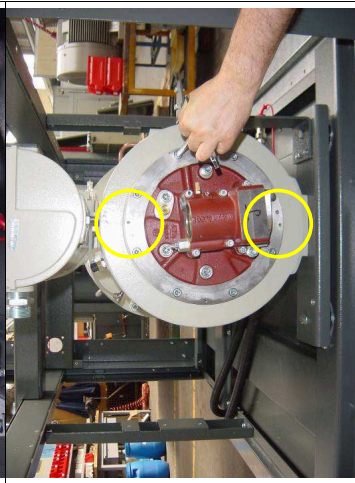
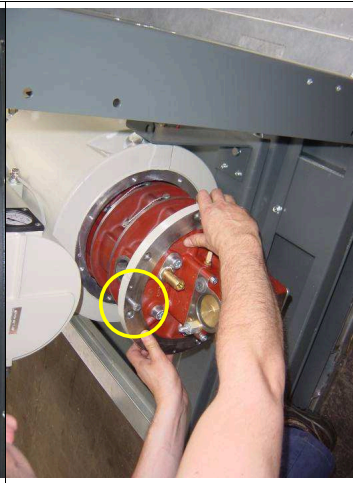
ID	-	Titolo	MS 800 series
Revision	0	Date	04/07/2008
Air-oil separator and rotor-stator unit disassembling procedure.			

Air-oil separator

Step 4		Unscrew the drilled screw of the oil return circuit and release the pipe.
Step 5		Lift and remove the air-oil separator.
Step 6		Lift and remove the air-oil separator.



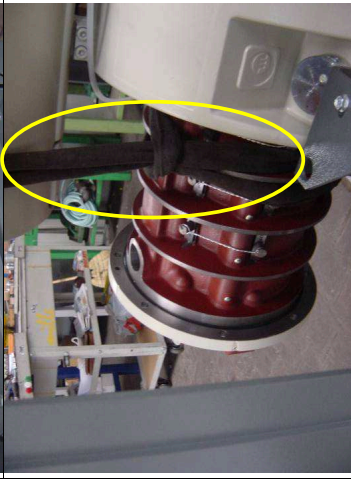
ID	-	Titolo	MS 800 series
Revision	0	Date	04/07/2008
Air-oil separator and rotor-stator unit disassembling procedure.			

Rotor-stator unit

Step 1		Remove the air intake valve cover.
Step 2		Unscrew the screws on the rotor-stator unit front side. Introducing the screws (highlighted in the figure of the following step) in the two threaded holes (highlighted in the side figure) begin pulling out the rotor-stator unit.
Step 3		Partially extract the rotor-stator unit from its housing in the oil chamber as shown in the side figure. To completely remove the rotor-stator unit, two different procedures (A and B) can be followed according to the tools that will be used to move it.

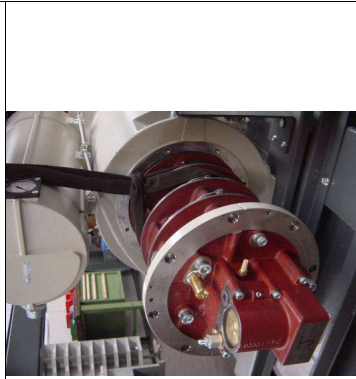


ID	-	Titolo	MS 800 series
Revision	0	Date	04/07/2008
Air-oil separator and rotor-stator unit disassembling procedure.			

Rotor-stator unit

Step A4	<p>If a pallet truck will be used, put some support between the pallet truck and the rotor-stator unit and pull out.</p>	
Step A5	<p>End of the procedure.</p>	
Step B4	<p>If a crane will be used, put the lifting bands around the rotor-stator unit in the exact position shown in the side figure.</p>	

ID	-	Titolo	MS 800 series
Revision	0	Date	04/07/2008
Air-oil separator and rotor-stator unit disassembling procedure.			

Rotor-stator unit

Step B5	<p>Lift and pull out the rotor-stator unit along its axis.</p>	
Step B6	<p>When completely out from its housing, pull the rotor-stator unit away.</p>	
Step B7	<p>End of the procedure.</p>	

Oil fill up

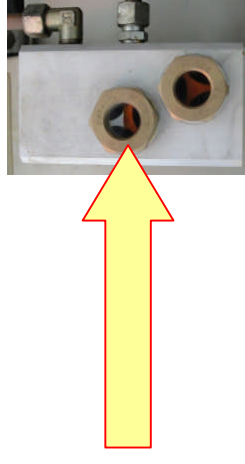
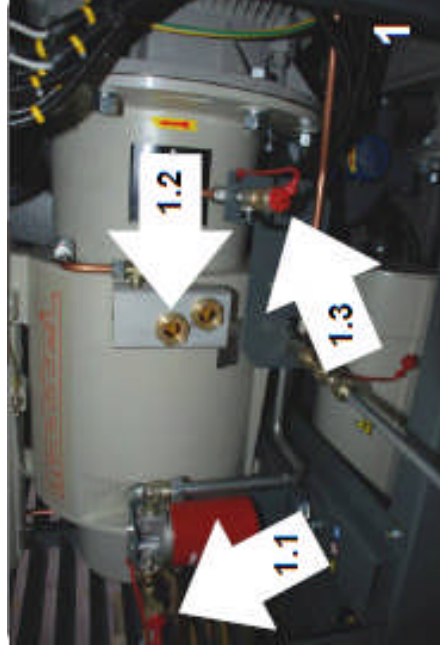
PREFACE

- The compressors are delivered empty.
The first **oil fill up** has to be performed before starting the machine.
- Compressors are equipped with some taps and fast plugs/couplings. To allow oil flows through the couplings, male and female have to be connected. Always VERIFY THE CLOSURE of the drain tap and of the exceeding-level tap before starting the compressors.
- The following procedure doesn't report or ref to other different issues (manuals or other docs) made to describe how to perform main OIL service operations. Manuals report which should be made for oil service, check and refilling.
- A wider acceptable oil level range is given by next procedure.

Oil fill up

[A]

- Connect the oil fill up and the exceeding-level fast couplings (1.1 and 1.3 in Fig. 1).
- Open the cooler drain tap (3.1 in Fig. 3).
- Open the exceeding-level tap (3.2 in Fig. 3).
- Fill the machine until the oil reaches **half of the upper level indicator** (1.2 in Fig. 1). That operation will require approximately 20 liters.
- Depending by oil and environment temperature (warm oil or ambient make it shorter) rest some minutes (5 min are enough) to stabilize oil level and then close the exceeding-level tap (3.2 in Fig. 3).



Oil fill up

[B]

Start compressor and let it operate for 2-3 minutes.

Oil could show some foam or bubbles on top, both in stopping or running: that's normal.

Before to check level, wait some minutes to let the foam vanish then repeat step as by point [A].

Start again compressor and now let it run until the thermostatic valve opens then stop it.

Time to open thermostatic valves depends by oil and ambient temperature, by oil cooler status (clean or not), and by operating pressure.

It could be from very few minutes up to 10 or more.

Thermostatic valves opening can be determined by oil temperature measures (*) or by hands feeling on pipes (**).

(*) in every compressor and M / MS units too, during the first working period, the thermostatic valve forces the oil temperature to a value higher than the nominal setup or the regime status.

Some fluctuations (one or more) could occur before the temperature will stabilize.

With 30°C ambient oil could reach 100°C and then fluctuates between 100 and 80 before to converge to 85°-90°C.

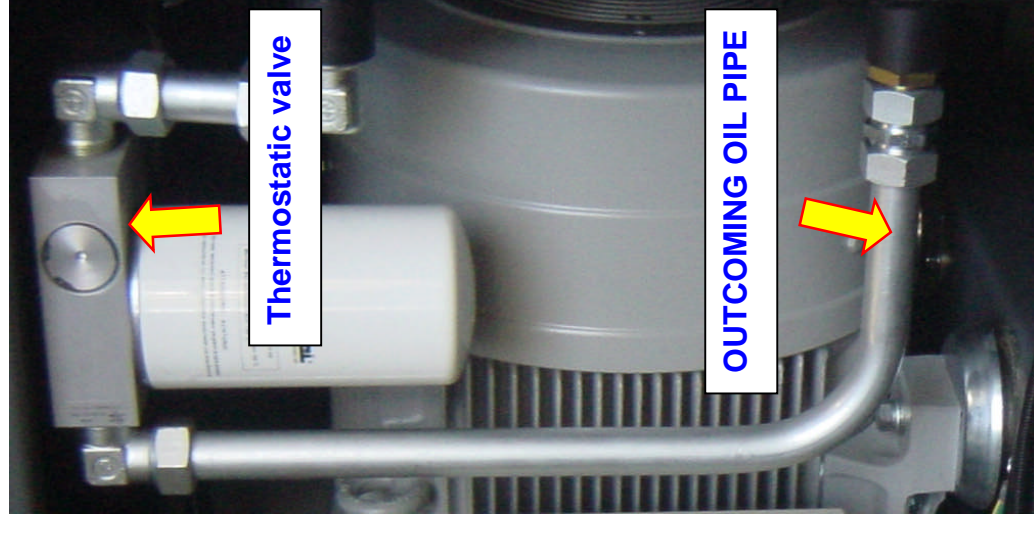
(**) putting hands on the OUTCOMING pipe from oil cooler (see picture).

Once the pipe becomes HOT, oil is flowing through the cooler.

Pressure rise and thermostatic valve opening will drive oil in the whole circuit internal volumes.

Depending by that, after running few minutes, the oil level could be even lower than minimum, and BOTTOM indicator could be empty.

Please note that during runtime, oil level could be lower than in stop time.



Oil fill up

[C]

Verify the correct level by means of the provided glass.

Attention !

stop compressor using normal stop (never emergency stop) and let some minutes elapsing to make foam vanish and oil stabilizes its level.

As cold is oil temperature, as longer foam vanish could be.

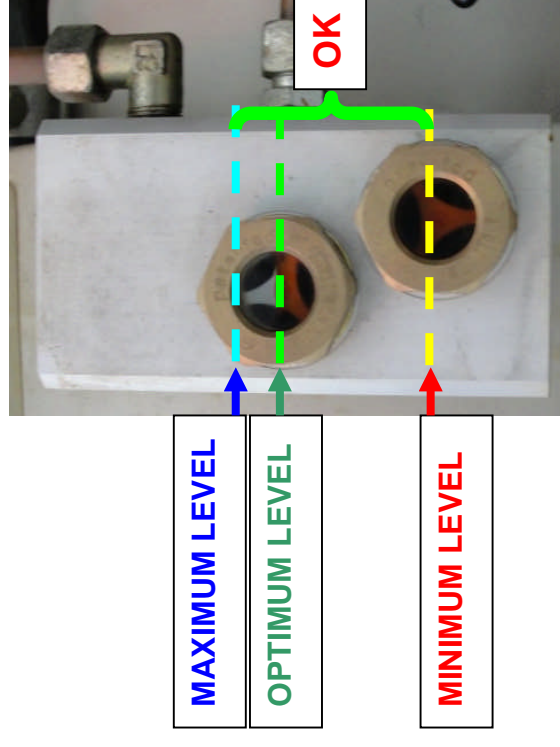
Repeat as above [A] and top up or drain the oil if necessary by mean of the exceeding-level tap (3.2 in Fig. 3).

Side picture issues proper level range at the end of fill up procedure :

MAXIMUM oil **must not exceed** glass (some air must be seen in the UPPER glass)

OPTIMUM oil should be in the middle of the UPPER sight glass

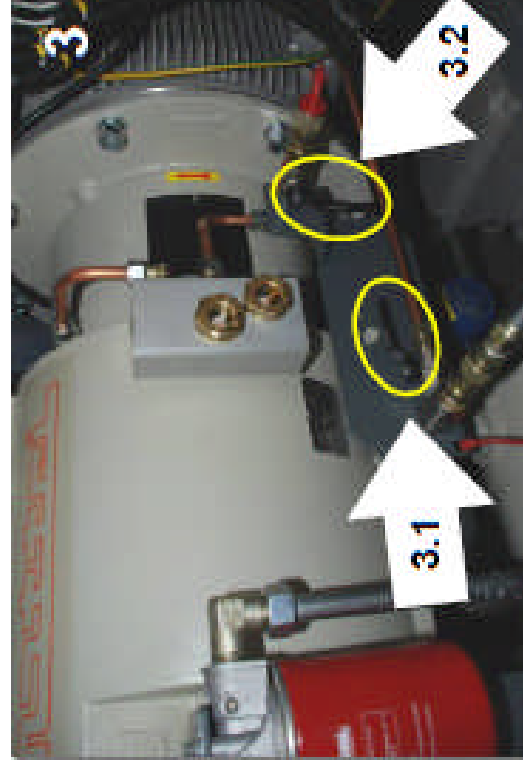
MINIMUM oil **must not be lower** than middle LOWER sight glass



[D]

Close the cooler draining (3.1 in Fig. 3) and **exceeding-level taps** (3.2 in Fig. 3) and **remove** all the fast couplings.

Be careful: leaving open those taps could cause a compressor fault.



6.4 PREVENTIVE MAINTENANCE OF COMPRESSOR MS 840 L (MATTEI)

DESCRIPTION	MATTEI CHAPTER USED	ECL KIT USED (PARTS MANUAL)	MAINTENANCE TO CARRY OUT EVERY ** (hours)						
			50	150	200	500	1500	6000	18000
DURING NORMAL PERIOD – CELLS COVERED									
OIL LEVEL CHECK AND OIL TIGHTNESS INSPECTION	/	/	X						
CLEAN THE AIR INTAKE FILTERS	7.03	/		X					
CLEAN THE OIL/AIR RADIATOR	7.03	/		X					
INSPECT CONDENSATE CAPACITIVE DRAIN GOOD OPERATION	/	/		X					
FIRST OIL CHANGE*	7.07	1–10–672–24			X				
CLEAN THE OIL RETURN VALVE	7.03	/				X			
OIL CHANGE*	7.07	1–10–672–24					X		
REPLACE OIL RETURN VALVES	7.03								
REPLACE THE OIL FILTER	7.04								
REPLACE THE THERMOSTATIC BULB	/								
REPLACE THE MAIN & SAFETY AIR FILTERS	7.03								
OIL CHANGE*	7.07	1–10–672–24 1–10–671–88						X	
REPLACE OIL RETURN VALVES	7.03								
REPLACE THE OIL FILTER	7.04								
REPLACE THE THERMOSTATIC BULB	/								
REPLACE THE MAIN & SAFETY AIR FILTERS	7.03								
REPLACE THE AIR/OIL SEPARATING ELEMENT	7.06								
OIL CHANGE*	7.07	1–10–672–24 1–10–671–88 1–10–672–20							X
REPLACE OIL RETURN VALVES	7.03								
REPLACE THE OIL FILTER	7.04								
REPLACE THE THERMOSTATIC BULB	/								
REPLACE THE MAIN & SAFETY AIR FILTERS	7.03								
REPLACE THE AIR/OIL SEPARATING ELEMENT	7.06								
REPLACE THE OIL FILLING FILTER	/								
REPLACE THE HUB ELASTIC ELEMENT	/								
REPLACE THE OIL CHAMBERS' GASKETS	/								
DURING STARTING PERIOD – CELLS NOT COVERED – IN ADDITION TO NORMAL MAINTENANCE									
REPLACE THE MAIN AIR FILTERS	7.03	▲			X				
OIL CHANGE*	7.07	1–10–672–24				X			
REPLACE OIL RETURN VALVES	7.03								
REPLACE THE OIL FILTER	7.04								
REPLACE THE THERMOSTATIC BULB	/								
REPLACE THE MAIN & SAFETY AIR FILTERS	7.03								

(*) For the oil type and quantity, refer to the "Greasing and lubrication" chapter.

(**) The 50 hours maintenance must be also carried out at 100, 150, 200, 250, 300 hours etc...

The 150 hours maintenance must be also carried out at 300, 450, 600 hours etc...

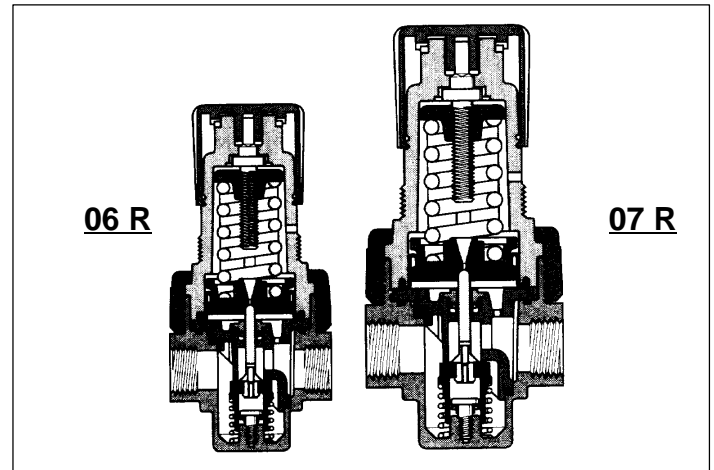
Note : the oil change frequency can be determined by periodical analyses of oil (Analyses made by the oil manufacture) After 500 hours of running, proceed every 200 hours (700 – 900 – 1100 – 1300 – 1500 hours) to the oil changing and analyses of drained oil.

6.5 AIR LINE REGULATORS 06R & 07R

This document is not available in French version near the supplier / Ce document n'est pas disponible en version française auprès du fournisseur

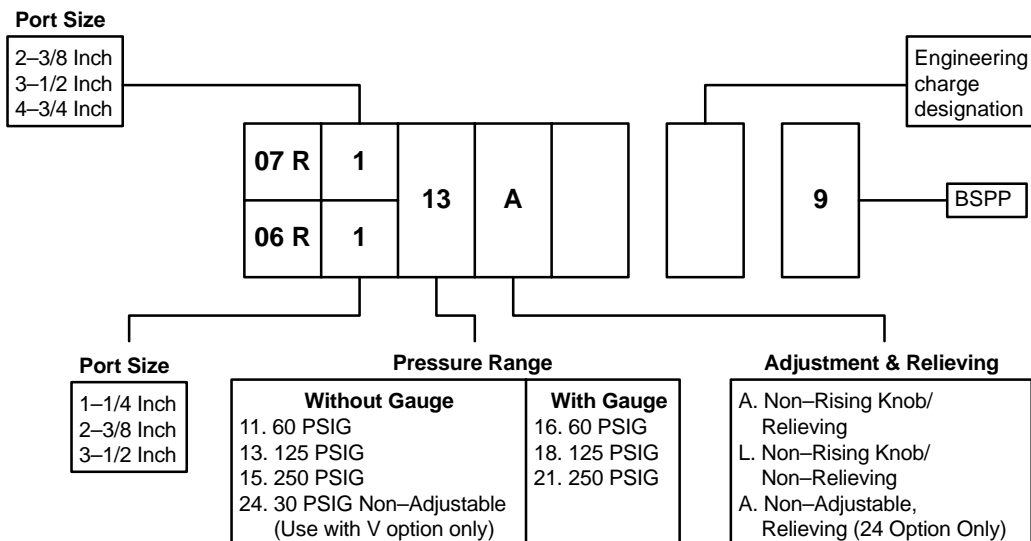
1. FEATURES

- Secondary aspiration plus balanced poppet provides quick response and accurate pressure regulation.
- Large reverse flow capability.
- Rolling diaphragm for extended life.
- Two high flow 1/4" gauge ports can be used as additional outlets.
- Easily serviced.
- Removable knob for panel mounting.



2. ORDERING INFORMATION

Figure 1 :



CAUTION: REGULATOR PRESSURE ADJUSTMENT

The working range of knob adjustment is designed to permit outlet pressures within their full range. Pressure adjustment beyond this range is also possible because the knob is not a limiting device. This is a common characteristic of most industrial regulators, and limiting devices may be obtained only by special design.

3. APPLICATION

The 06R series regulators are designed to provide quick response, and accurate pressure regulation for the most demanding industrial applications. The use of rolling diaphragm design results in significantly longer life, and therefore helps to eliminate maintenance and costly downtime. Rolling diaphragms and balanced poppets are used to provide accurate pressure regulation, and the built in capability of reverse flow without the use of check valves.



WARNING

**Do not connect regulator to bottled gas.
Do not exceed maximum primary pressure rating.
Product rupture can cause serious injury.**

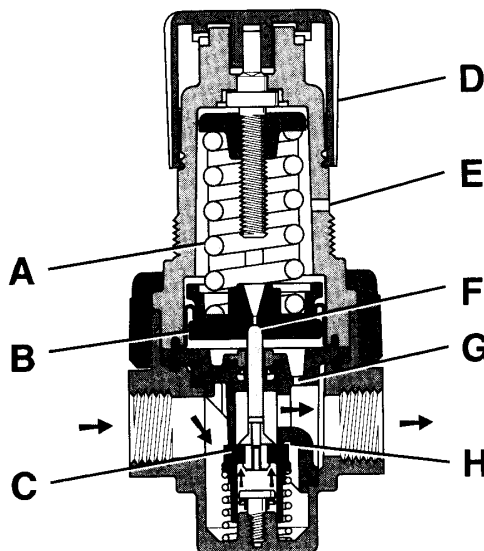
4. OPERATION

With the knob **(D)** turned fully counterclockwise (no spring load), and pressure supplied to the regulator inlet port, the valve poppet assembly **(C)** is closed. Turning the knob clockwise applies a load to control spring **(A)**. This load causes the diaphragm **(B)** and the valve poppet assembly **(C)** to move downward allowing flow across the seat area **(H)** created between the poppet assembly and the body. Pressure in the downstream line is sensed below the diaphragm **(B)** and offsets the load of spring **(A)**. As downstream pressure rises, poppet assembly **(C)** and diaphragm **(B)** move upward until the area **(H)** is closed and the load of the spring **(A)** and pressure under diaphragm **(B)** are in balance. A reduced outlet pressure has now been obtained, depending on spring load. Creating a demand downstream, such as opening a valve, results in a reduced pressure under the diaphragm **(B)**. The load of control spring **(A)** now causes the poppet assembly to move downward opening seat area **(H)** and allowing air to flow downstream. The flow of downstream air is metered by the amount of opening **(H)**.

During low flow requirements, the amount of opening at the seal **(H)** is small, while at high flow it is large. The downstream pressure signal, which regulates the amount of opening, requires an adjustment over this range, in order to attempt a constant output. This adjustment is the orifice **(G)**, which is sized and located in such a manner as to provide a compensation to the downstream pressure signal transmitted to the diaphragm. This effect is called aspiration and its effect is to maintain downstream pressure nearly constant over a wide range of flow demands.

Should downstream pressure exceed the desired regulated pressure, the excess pressure will cause the diaphragm **(B)** to move upward against control spring **(A)**, open vent hole **(F)** and vent the excess pressure to atmosphere through the hole in the bonnet **(E)**. (This occurs in the standard relieving type regulator only.)

Figure 2 :



5. SPARE PARTS AND ACCESSORIES

DESIGNATION	06 R	07 R
Body service kit (balanced poppet)	.	.
Bonnet assembly kit	PS 715 P	
Gauge 60 PSIG 160 PSIG 300 PSIG	K4520N14060	P 781 641
	K4520N14160	P 781 642
	K4520M14300	P 781 643
Mounting bracket kit	PS 707 P	PS 807 P
Panel mount nuts (plastic)	P 04082	
Repair kit Non-Relieving Relieving	PS 709 P	PS 809 P
	PS 708 P	PS 808 P
Spring 1-60 PSIG Range 5-125 PSIG Range	P 04062	
	P 04063	
Tamperproof kit	PS 737 P	

6.6 VALVES T 211.25...H (PARKER)

Location	Item	ECL Code	Reference	Coil	Seals kit	Spare kiT
Long travel blowers CTR	B.3	0-06-325-77	T211 25 22 H	0-05-327-92	0-05-327-17	0-05-327-25
	B.4					
	B.5					
	B.6					
Long travel blowers CPO	F.3					
	F.4					
	F.5					
	F.6					
Bath feeding locking	G.1					
	G.2					
Clamp extracting	L.4.					
	L.5.					
	L.6.					

NON CONTRACTUAL VIEW



VALVES SERIES T



"T", "GG", & "SS" Series

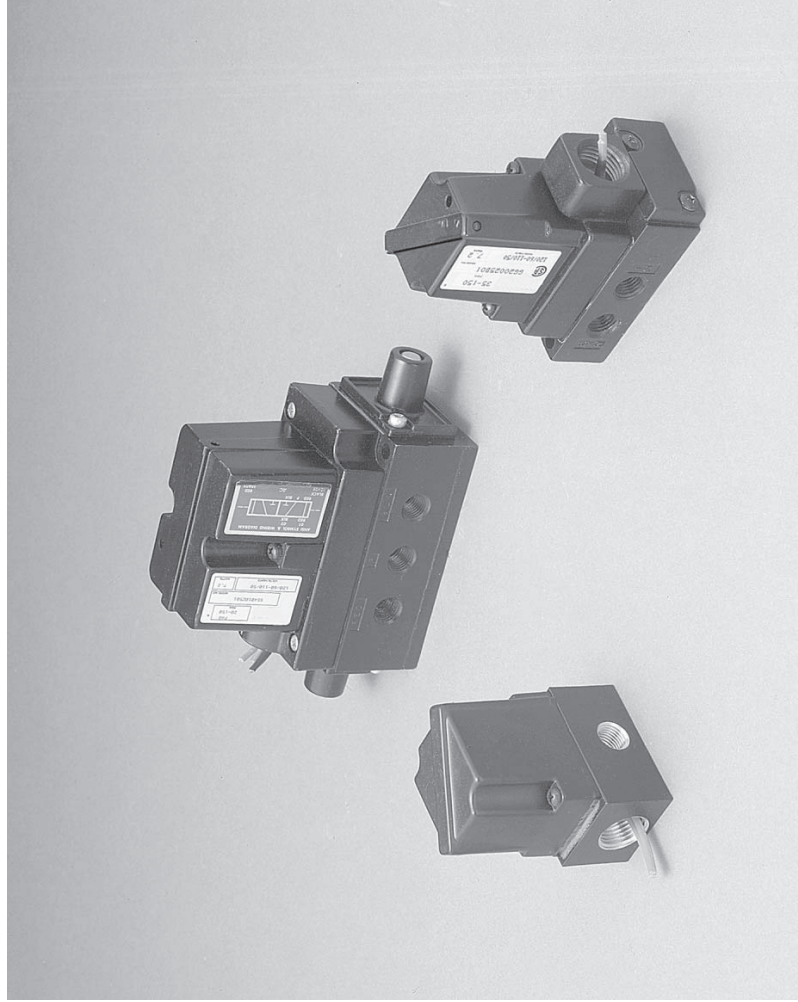
Air Control Valves

3-Way, 3-Port, 2-Position

4-Way, 4-Port, 2-Position

4-Way, 5-Port, 2 & 3-Position

Catalog 0620-E/USA - EXTRACT
April 2004



! WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application including consequences of any failure, and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

Offer of Sale

The items described in this document are hereby offered for sale by Parker Hannifin Corporation, its subsidiaries or its authorized distributors. This offer and its acceptance are governed by the provisions stated on the separate page of this document entitled "Offer of Sale".

© Copyright 2004, Parker Hannifin Corporation. All Rights Reserved

Parker Pneumatic

www.parker.com/pneumatic

"T" Series

Features, Model Number Index.....2

Model Selection, Dimensions.....3

Cross Reference Information4

Description

The T Series Valve is a 2-Position, 2 and 3-Way, single solenoid, direct operated, spring returned, 1/4" side ported valve. It may be used as normally closed or normally open, also as a selector valve.

Operation

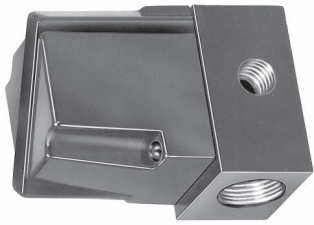
Valve will operate mounted in any position. See mounting dimensions and port locations.

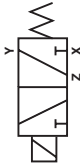
Selection table shows typical piping connections and maximum pressure differentials for each model number. "Maximum Pressure Differential" is the maximum allowable difference between pressures recorded at any two working ports of the valve. The highest pressure that may be connected to any port is 150 PSI.

For 2-Way operation, plugs must be screwed in and sealed bubble tight for valve to work properly.

Specifications

- Operating pressure, vacuum to 150 PSI (1035 kPa).
- Operating temperature, 0°F to 140°F (–18°C to 71 °C).
- Class B solenoid, dual rated 120V/60Hz., 110V/50Hz., continuous duty 120V/60Hz., 7.2 watts, .26 amp inrush, .14 amp holding. Other voltages available.
- U.L. and CSA listed.





Model Number Index

Basic Series

T

Operator

200

Operator

200 Standard
210 Manual Override

Port Size

25

Port Size

25 1/4" NPT

Lower Orifice Size

H

Lower Orifice Size

D 1/16"
H 1/8"

Spring

2

Spring

1 0.5 lb.
2 1.5 lb.

Top Orifice Size

F

Top Orifice Size

F 3/32"

Coil Option

01

Coil Option

01 120 / 60
02 240 / 60
15 48 VDC
20 24 / 60
21 12 VDC
22 24 VDC
23 125 VDC
34 150 / 60
58 250 VDC
59 120 / 50
63 240 / 50

Modification

M16

Modification

M16 72" Leads
M25 72" Leads &
Top Seat w/o
Shading Coil

Note: Shaded options have been discontinued. Refer to back of Catalog for Cross Reference Information.

Model Selection, Dimensions

3-Way, 3-Port, 2-Position Single Solenoid

Model Selection Information

Service	Maximum Pressure ¹ Differential	Minimum Orifice Dia. Between Ports	Cv Capacity Coefficient For Flow Between Ports				Piping Connections			Valve Model Number
			X & Y	Y & Z	X → Y	Y → Z	Y → X	Port X	Port Y	Port Z
2-Way Normally Closed	150 50	1/16" 1/8"	—	—	0.09 0.22	—	—	Inlet Inlet	Outlet Outlet	Plugged [†] Plugged [†]
2-Way Normally Open	150	—	3/32"	—	—	0.16	—	Plugged [†]	Inlet	Outlet
3-Way Normally Closed	150 50	1/16" 1/8"	3/32" 3/32"	0.09 0.22	0.16 0.14	—	—	Inlet Inlet	Outlet Outlet	Exhaust Exhaust

[†] "Maximum Pressure Differential" is the maximum allowable difference between pressures recorded at any two working ports of the valve. The highest pressure that may be connected to any port is 150 PSI.

Model numbers shown are for 120V/60Hz. coil. See Coil Selection Chart for other options.

Solenoid Coil Identification and Specification

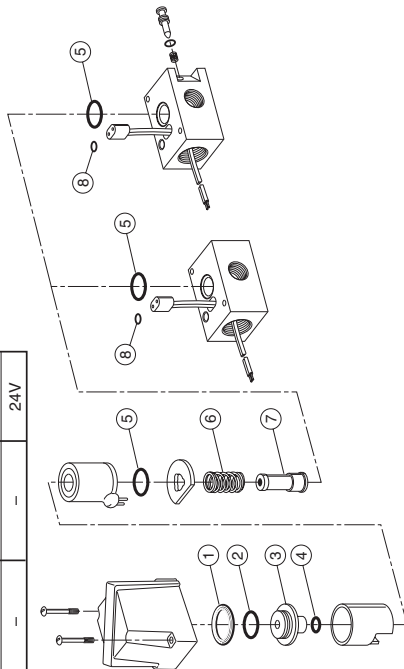
Part No.	60 HzAC	50 HzAC	DC
P4615401	120V	110V	—
P4615402	240V	220V	—
P4615421	—	—	12V
P4615422	—	—	24V

Solenoid Service Kits
D1F/H1F PS5398

Consists of: No's 1 thru 8

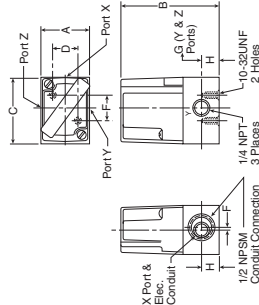
D2F/H2F PS5399

Consists of: No's 1 thru 8



Dimensions – T200

	A	B	C	D	E	F	G	H
inches	1.59	3.31	2.25	.88	.88	.09	.50	.50
mm	40	84	51	22	22	2.4	14	13



Cross Reference

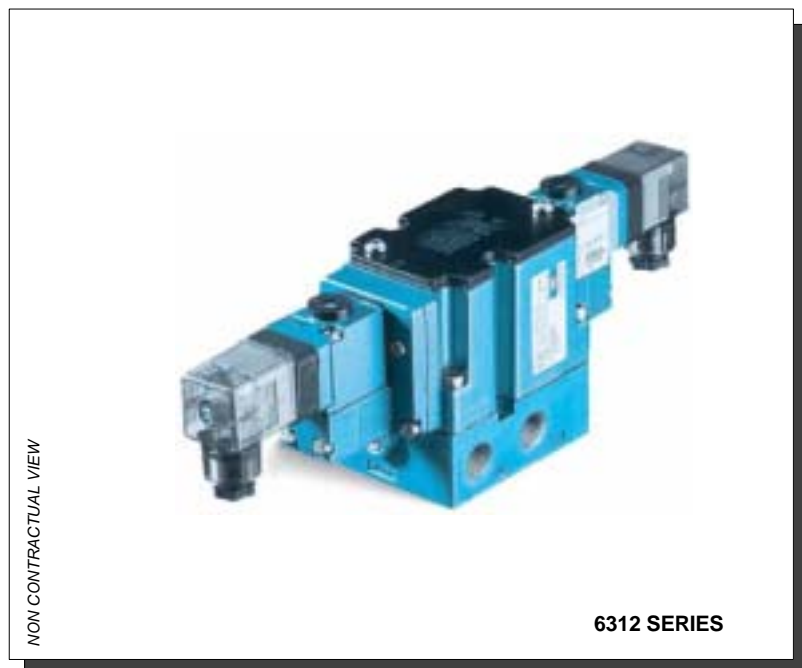
Discontinued T Valve Number	Suggested T Valve Replacement or Kit	Suggested Functional Replacement - Cyclone Series 2-Way NC 2-Way NO 3-Way NC 3-Way NO	Notes
T20025D1F01	Coil P4615401 & PS5398 Kit	741140115B	
T20025D1F21	Coil P4615421 & PS5398 Kit	741140122B	
T20025D2F01M16	Coil P4615422 & PS5398 Kit	741140123B	
T20025D2F01	T20025D2F01 18" Leads	744130115B	1
T20025D2F15	Coil P4615415 & PS5398 Kit	NO CROSS REFERENCE VOLTAGE IS 48 VDC	4
T20025D2F20	Coil P4615422 & PS5398 Kit	741140113B	
T20025D2F21M25	T20025D2F21 no shading coil	744130113B	
T20025H1F01	Coil P4615401 & PS5398 Kit	741140115B	
T20025H1F02	Coil P4615402 & PS5398 Kit	740120115B	742110115B
T20025H1F15	Coil P4615415 & PS5398 Kit	741140116B	742110116B
T20025H1F20	Coil P4615420 & PS5398 Kit	NO CROSS REFERENCE VOLTAGE IS 48 VDC	4
T20025H1F21	Coil P4615421 & PS5398 Kit	741140113B 740120113B 741140122B 740120122B	742110113B 742110122B
T20025H1F22	Coil P4615422 & PS5398 Kit	741140123B	742110123B
T20025H1F23	Coil P4615423 & PS5398 Kit	NO CROSS REFERENCE VOLTAGE IS 125 VDC	4
T21025D1F01	Coil P4615401 & PS5398 Kit	741140115B	2
T21025D2F01	T20025D2F01 no override	741140115B 744130115B	2 2
T21025D2F02	T20025D2F02 no override	741140116B	2
T21025D2F15	Coil P4615415 & PS5398 Kit	744130116B	2
T21025D2F20	Coil P4615420 & PS5398 Kit	NO CROSS REFERENCE VOLTAGE IS 48 VDC	4
T21025D2F21	Coil P4615421 & PS5398 Kit	741140113B 744130113B 741140122B 744130122B	2 2 2
T21025D2F22	T20025D2F22 no override	741140123B	2
T21025D2F23	Coil P4615423 & PS5398 Kit	NO CROSS REFERENCE VOLTAGE IS 125 VDC	4
T21025H1F01	Coil P4615401 & PS5398 Kit	741140115B 740120115B	742110115B 742110116B
T21025H1F02	Coil P4615402 & PS5398 Kit	741140116B	2
T21025H1F22M16	Coil P4615422 & PS5398 Kit	741140123B	742110123B
T21025H2F01	T20025H2F01 no override	741140115B	
T21025H2F02	T20025H2F02 no override	741140115B 740120115B 744130115B	1, 2
T21025H2F22	T20025H2F22 no override	741140116B 740120116B 744130116B 744130123B	
TL20025D2F01	T20025D2F01 no light	741140115B	3
TL20025H1F01M16	Coil P4615401 & PS5398 Kit	740120115B	1, 3
TL21025D2F01	T20025D2F01 no light/override	741140115B	2, 3
TL21025D2F01M16	T20025D2F01 no light/override 18"	741140115B	1, 2, 3

Notes

1. The M16 Modification is 72" leads. The valve selected has 19" leads.
2. The T210 valve has a Non-Locking Manual Override. The valve selected has no Override.
3. The TL valve had an Indicator Light. The valve selected has No Light.
4. Use Repair Kits to Service Valve.

6.7 VALVES 6312D (MAC)

Location	Item	ECL Code	Reference
Prehension bell on tapping	C.2.	1-10-321-59	6312D-271-PM-611JJAL01
Hopper gate	I.2.	1-10-322-60	6312D-371-PM-611JJAL01
Clamp actuator lowering	K.1.		

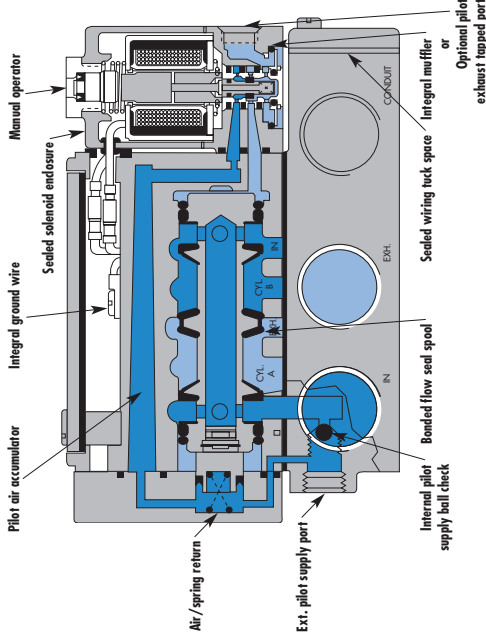


Individual mounting

sub-base non "plug-in"	sub-base "plug-in"
---------------------------	-----------------------

Manifold mounting

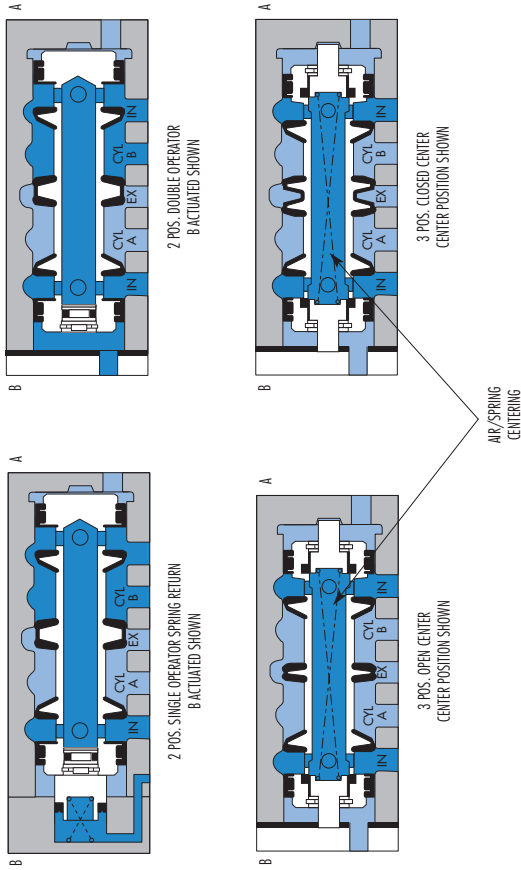
sub-base non "plug-in"	sub-base "plug-in"
---------------------------	-----------------------



SERIES FEATURES

- The patented MACSOLENOID® with its non-turn out feature on AC service.
- A large checked accumulator for consistent shifting on single and double solenoid models.
- A plug-in design that provides for internal or external pilot with or without lights and all electrical and air plumbing in the base — the valve portion is the same.
- Non-lubricated or lubricated service.
- Optional low wattage DC solenoids down to 1 watt.
- Optional indicator lights, and various types of manual operators.
- Non plug-in or external plug-in models are available.

SPOOL CONFIGURATIONS



VALVE CONFIGURATIONS AVAILABLE

The versatile 6300 Series provides high flow, extremely fast response, and long life in a compact package and is available in the following configurations:

- 2-Pos., single or double operators (solenoid or remote air).
- 3-Pos., double operator-Closed Center, Open Center or Pressure Center (solenoid or remote air).
- Single pressure.
- Dual pressure on manifolds with sandwich regulators.
- Individual base or add-on manifold base.
- Internal pilot or for Vacuum to 25 PSI main valve pressures, external pilot.
- Manual and mechanical operators available.
- All models available with sandwich regulators (except remote air pilot).

REMOTE AIR PILOT OPERATED VALVES

These remote air versions feature:

- A large checked accumulator for air/spring return on single remote air models.
- Non-lubricated or lubricated service.
- All piping connections, including the remote air pilot supply, in the base.

REMOTE AIR PILOT, PILOT OPERATED VALVES

These special air versions have the same features as the remote air pilot operated models, but additionally feature:

- A manual operator and indicator.
 - Ability to use a pilot signal pressure different from the main valve pressure.
- Pilot signal can be from 20 to 50 PSIG regardless of main valve pressure.

Function	Port size	Flow (Max)	Individual mounting	Series
4/2 - 4/3	1/4" - 3/8" - 1/2"	3.0 C_v	sub-base non "plug-in"	

OPERATIONAL BENEFITS

- Balanced spool, immune to variations of pressure.
- Short stroke with high flow.
- High shifting forces.
- Checked accumulator guarantees maximum pilot pressure.
- Powerful return force thanks to the combination of mechanical and air springs.
- Bonded spool with minimum friction, shifting in a glass-like finished bore.
- Wiping effect eliminates sticking.
- Pilot valve with balanced poppet, high flow, short and consistent response times.

HOW TO ORDER

Port size	Pilot air	4/2	Single operator	4/2	Double operator	4/3	Closed center	4/3	Open center
Valve less base									
1/4" NPTF	Internal		6312D-000-PM-XXYZZ		6322D-000-PM-XXYZZ		6332D-000-PM-XXYZZ		6342D-000-PM-XXYZZ
	External		6312D-131-PM-XXYZZ		6322D-131-PM-XXYZZ		6332D-131-PM-XXYZZ		6342D-131-PM-XXYZZ
3/8" NPTF	Internal		6312D-141-PM-XXYZZ		6322D-141-PM-XXYZZ		6332D-141-PM-XXYZZ		6342D-141-PM-XXYZZ
	External		6312D-231-PM-XXYZZ		6322D-231-PM-XXYZZ		6332D-231-PM-XXYZZ		6342D-231-PM-XXYZZ
1/2" NPTF	Internal		6312D-241-PM-XXYZZ		6322D-241-PM-XXYZZ		6332D-241-PM-XXYZZ		6342D-241-PM-XXYZZ
	External		6312D-331-PM-XXYZZ		6322D-331-PM-XXYZZ		6332D-331-PM-XXYZZ		6342D-331-PM-XXYZZ
1/2" NPTF	Internal		6312D-341-PM-XXYZZ		6322D-341-PM-XXYZZ		6332D-341-PM-XXYZZ		6342D-341-PM-XXYZZ
	External		6312D-441-PM-XXYZZ		6322D-441-PM-XXYZZ		6332D-441-PM-XXYZZ		6342D-441-PM-XXYZZ

Note : Above codes shown are for side ports.

SOLENOID OPERATOR

XX Y ZZ

XX	Y	ZZ	Electrical connection
11	1	JB	Rectangular connector
12	1	JB	Rectangular connector with light
22	2	JA	Square connector
59		JA	Square connector with light
67		BA	Flying leads (18")
61			Flying leads (18")

• Other options available, see page 349.

OPTIONS

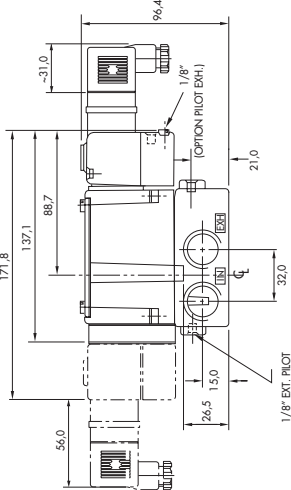
6312D-XXX-PM-XXYZZ

- For piped pilot exhaust replace M by P.
 - For bottom cylinder ports (excluding 1/2"), replace by 4.
 - For dual pressure valves (see page 293 for use with sandwich regulators), replace by 5.
- Note : 1. The valve less base is always the same for internal or external pilot. These options are effected in the base.
2. To order bases without the valve, choose the base from the above table, then add 6300D as a prefix. Example 6300D-131.

TECHNICAL DATA	
Fluid :	Compressed air, vacuum, inert gases
Pressure range :	Internal pilot : single operator and 3 positions : 25-150 PSI double operator : 10-150 PSI External pilot : vacuum to 150 PSI
Pilot pressure :	Single operator and 3 positions : 25-150 PSI Double operator : 10-150 PSI
Lubrication :	Not required, if used select a medium aniline point lubricant (between 180°F to 210°F)
Filtration :	40 µ
Temperature range :	0°F to 120°F (-18°C to 50°C)
Flow (at 6 bar, ΔP=1bar) :	1/4" (2.0 C _v), 3/8" : (2.6 C _v), 1/2" (3.0 C _v)
Leak rate :	100 cm ³ /min
Coil :	Epoxy encapsulated - class A wires - Continuous duty.
Voltage range :	-15% to +10% of nominal voltage
Protection :	Consult factory
Power :	- Inrush : 14.8 VA Holding : 10.9 VA = 1 to 17.1 W
Response times :	24 VDC (8.5 W) Energize : 10 ms De-energize : 1 ms 120/60 Energize : 4-13 ms De-energize : 10-17 ms

- Solenoid operator (power ≥ 4 W) : D1-XYAA, cover mounting screws 35206 and seal 16234.
- Pilot valve : PMEXXYZZ, including seal 16337. • Pressure seal between valve and base : 16298.
- Mounting screw valve to base (M4) : 35303.
- BSP threads.

Dimensions shown are metric (mm)



Function	Port size	Flow (Max)	Individual mounting	Series
----------	-----------	------------	---------------------	--------

4/2 - 4/3 1/4" - 3/8" - 1/2" 3.0 C_v

OPERATIONAL BENEFITS

1. Balanced spool, immune to variations of pressure.
2. Short stroke with high flow.
3. High shifting forces.
4. Checked accumulator guarantees maximum pilot pressure.
5. Powerful return force thanks to the combination of mechanical and air springs.
6. Bonded spool with minimum friction, shifting in a glass-like finished bore.
7. Wiping effect eliminates sticking.
8. Pilot valve with balanced poppet, high flow, short and consistent response times.

HOW TO ORDER

Port size	Pilot air	4/2	Double operator	4/3	4/3
Valve less base					
1/4" NPTF	Internal	631D-000-PM-xxxDA	632D-000-PM-xxxDA	633D-000-PM-xxxDA	634D-000-PM-xxxDA
	External	631D-111-PM-xxxDA	632D-111-PM-xxxDA	633D-111-PM-xxxDA	634D-111-PM-xxxDA
3/8" NPTF	Internal	631D-121-PM-xxxDA	632D-121-PM-xxxDA	633D-121-PM-xxxDA	634D-121-PM-xxxDA
	External	631D-211-PM-xxxDA	632D-211-PM-xxxDA	633D-211-PM-xxxDA	634D-211-PM-xxxDA
1/2" NPTF	Internal	631D-221-PM-xxxDA	632D-221-PM-xxxDA	633D-221-PM-xxxDA	634D-221-PM-xxxDA
	External	631D-311-PM-xxxDA	632D-311-PM-xxxDA	633D-311-PM-xxxDA	634D-311-PM-xxxDA

Note : Above codes shown are for side ports without lights.

SOLENOID OPERATOR

XX	Voltage	Y	Manual operator
11	120/60 (110/50)	1	Non-locking
12	240/60 (220/50)	2	Locking
22	24/60 (24/50)		
59	24 VDC (2.5 W)		
87	24 VDC (17.1 W)		
61	24 VDC (8.5 W)		

- Other options available, see page 349.

OPTIONS

631D-xxx-PM-xxxDA

- For piped pilot exhaust replace M by P.
- For bottom ports (excluding 1/2"), replace by 4 (no light), by 5 (sgl. light), by 6 (dbl. light).
- For side ports with lights on base, replace by 2 (sgl. light), by 3 (dbl. light).
- For lights on valve body, replace by 3.
- For dual pressure valves with lights on valve body (see page 293 for use with sandwich regulators), replace by 6.

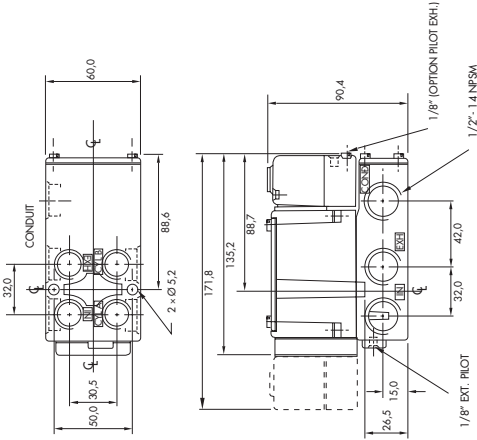
Note : 1. The valve less base is always the same for internal or external pilot. These options are effected in the base.
2. To order bases without the valve, choose the base from the above table, then add 6300D as a prefix. Example 6300D-111.

TECHNICAL DATA	
Fluid :	Compressed air, vacuum, inert gases
Pressure range :	Internal pilot : single operator and 3 positions : 25-150 PSI double operator : 10-150 PSI External pilot : vacuum to 150 PSI
Pilot pressure :	Single operator and 3 positions : 25-150 PSI Double operator : 10-150 PSI
Lubrication :	Not required, if used select a medium aniline point lubricant (between 180°F to 210°F)
Filtration :	40 µ
Temperature range :	0°F to 120°F (-18°C to 50°C)
Flow (at 6 bar, ΔP=1bar) :	1/4" (2.0 C _v), 3/8" : (2.6 C _v), 1/2" (3.0 C _v)
Leak rate :	100 cm ³ /min
Coil :	Epoxy encapsulated - class A wires - Continuous duty.
Voltage range :	-15% to +10% of nominal voltage
Protection :	Consult factory
Power :	- Inrush : 14.8 VA Holding : 10.9 VA = 1 to 17.1 W
Response times :	Energize : 10 ms De-energize : 1 ms 120/60 Energize : 4-13 ms De-energize : 10-17 ms

- Spare parts :
- Solenoid operator (power ≥ 4 W) : D1-XXBE cover mounting screws 35206 and seal 16234.
 - Pilot valve : PMEXXXDAE, including seal 16337. • Pressure seal between valve and base : 16298.
 - Mounting screw valve to base (x4) : 35303.
- Options :
- BSP threads.

DIMENSIONS

Dimensions shown are metric (mm)



Function	Port size	Flow (Max)	Series
4 / 2 - 4 / 3	3 / 8" - 1 / 2"	3.0 C _v	Manifold mounting
			sub-base non "plug-in"

OPERATIONAL BENEFITS

- Balanced spool, immune to variations of pressure.
- Short stroke with high flow.
- High shifting forces.
- Checked accumulator guarantees maximum pilot pressure.
- Powerful return force thanks to the combination of mechanical and air springs.
- Bonded spool with minimum friction, shifting in a glass-like finished bore.
- Wiping effect eliminates sticking.
- Pilot valve with balanced poppet, high flow, short and consistent response times.

HOW TO ORDER

Port size	Pilot air	4 / 2	4 / 2	4 / 2	4 / 3	4 / 3	4 / 3	4 / 3	4 / 3
		Single operator	Double operator	Double operator	Closed center	Open center	Pressure center		
Valve less base		6312D-000-PW-XXYZZ	6322D-000-PW-XXYZZ	6322D-000-PW-XXYZZ	6322D-000-PW-XXYZZ	6322D-000-PW-XXYZZ	6322D-000-PW-XXYZZ		
sub-base	Internal	6312D-531-PW-XXYZZ	6322D-531-PW-XXYZZ	6322D-531-PW-XXYZZ	6322D-531-PW-XXYZZ	6322D-531-PW-XXYZZ	6322D-531-PW-XXYZZ		
3 / 8" NPTF	External	6312D-541-PW-XXYZZ	6322D-541-PW-XXYZZ	6322D-541-PW-XXYZZ	6322D-541-PW-XXYZZ	6322D-541-PW-XXYZZ	6322D-541-PW-XXYZZ		
sub-base	Internal	6312D-631-PW-XXYZZ	6322D-631-PW-XXYZZ	6322D-631-PW-XXYZZ	6322D-631-PW-XXYZZ	6322D-631-PW-XXYZZ	6322D-631-PW-XXYZZ		
1 / 2" NPTF	External	6312D-641-PW-XXYZZ	6322D-641-PW-XXYZZ	6322D-641-PW-XXYZZ	6322D-641-PW-XXYZZ	6322D-641-PW-XXYZZ	6322D-641-PW-XXYZZ		

Note : Above codes shown are for side cylinder ports.

SOLENOID OPERATOR

XX	YY	ZZ	YY	ZZ	YY	ZZ
11	120/60	110/50	1	Non-locking	1	Rectangular connector
12	240/60	220/50	2	Locking	2	Rectangular connector with light
22	240/60	240/50			JA	Square connector
59	2A VDC (2.5 W)				BA	Square connector with light
87	2A VDC (17.1 W)					Flying leads (1.8")
61	2A VDC (8.5 W)					

• Other options available, see page 349.

OPTIONS

6312D-XXX-PW-XXYZZ

- For piped pilot exhaust replace M by P.
- For bottom cylinder ports, replace by 4.
- For bottom and side cylinder ports, replace by 7.
- For dual pressure valves (see page 293 for use with sandwich regulators), replace by 5.

MODIFICATIONS - MOD 0210 Bottom inlet port in addition to side inlet port - TO ORDER: 6312D-531-PW-111JA MOD 0210

- Note :
- The valveless base is always the same for internal or external pilot. These options are effected in the manifold.
 - To order manifolds without the valve, choose the manifold from the above table, then add 6300D as a prefix. Example: 6300D-631.
 - When ordering an external pilot connection for manifold bases, a common external pilot port is standard. One connection only is required for all the valves in the manifold whether single or double solenoid.
 - Manifolds for solenoid and remote air operated valves must be ganged separately.

TECHNICAL DATA

Fluid :	Compressed air, vacuum, inert gases
Pressure range :	Internal pilot : single operator and 3 positions : 25-150 PSI double operator : 10-150 PSI External pilot : vacuum to 150 PSI
Pilot pressure :	Single operator and 3 positions : 25-150 PSI Double operator : 10-150 PSI
Lubrication :	Not required, if used select a medium aniline point lubricant (between 180°F to 210°F)
Filtration :	40 µ
Temperature range :	0°F to 120°F (-18°C to 50°C)
Flow (at 6 bar, ΔP=1bar) :	3/8" : (2.6 C _v) 1/2" (3.0 C _v)
Leak rate :	100 cm ³ /min
Coil :	Epoxy encapsulated - class A wires - Continuous duty.
Voltage range :	-15% to +10% of nominal voltage
Protection :	Consult factory
Power :	- Inrush : 14.8 VA Holding : 10.9 VA = 1 to 17.1 W
Response times :	24 VDC (8.5 W) Energize : 10 ms De-energize : 11 ms 120/60 Energize : 4-13 ms De-energize : 10-17 ms

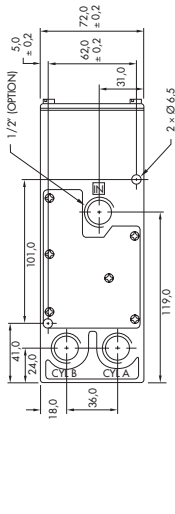
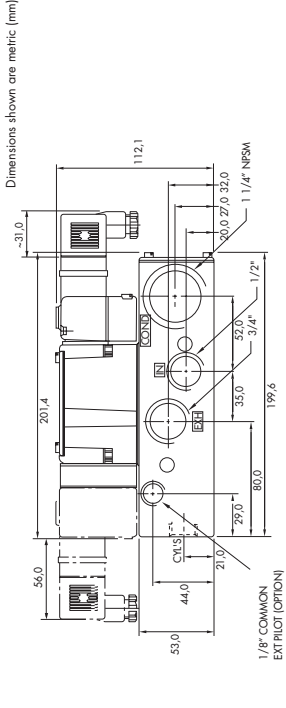
Spare parts :

- Solenoid operator (power ≥ 4 W) : D1-XXAA, cover mounting screws 35206 and seal 16234.
- Pilot valve : PMEXXYZZ, including seal 16307. • Pressure seal between valve and base : 16396.
- Mounting screw valve to base (M4) : 35303. • Thread (X2) : 19624. • Fastening kit : N63002-01
- Islet isolator : 32839. • Exhaust isolator : 28309. • Blank station cover plate : M63014.

• BSP threads.

Options :

DIMENSIONS



Function	Port size	Flow (Max)	Series
4/2 - 4/3	3/8" - 1/2"	3.0 Cv	sub-base plug-in

OPERATIONAL BENEFITS

- Balanced spool, immune to variations of pressure.
- Short stroke with high flow.
- High shifting forces.
- Checked accumulator guarantees maximum pilot pressure.
- Powerful return force thanks to the combination of mechanical and air springs.
- Bonded spool with minimum friction, shifting in a glass-like finished bore.
- Wiping effect eliminates sticking.
- Pilot valve with balanced poppet, high flow, short and consistent response times.

HOW TO ORDER

Port size	Pilot air	4/2	4/2	4/3	4/3	4/3
		Single operator	Double operator	Closed center	Open center	Pressure center
Valve less base		631D-000-PM-xxTDA	632D-000-PM-xxTDA	633D-000-PM-xxTDA	634D-000-PM-xxTDA	635D-000-PM-xxTDA
sub-base	Internal	631D-511-PM-xxTDA	632D-511-PM-xxTDA	633D-511-PM-xxTDA	634D-511-PM-xxTDA	635D-511-PM-xxTDA
3/8" NPTF	External	631D-521-PM-xxTDA	632D-521-PM-xxTDA	633D-521-PM-xxTDA	634D-521-PM-xxTDA	635D-521-PM-xxTDA
sub-base	Internal	631D-611-PM-xxTDA	632D-611-PM-xxTDA	633D-611-PM-xxTDA	634D-611-PM-xxTDA	635D-611-PM-xxTDA
1/2" NPTF	External	631D-621-PM-xxTDA	632D-621-PM-xxTDA	633D-621-PM-xxTDA	634D-621-PM-xxTDA	635D-621-PM-xxTDA

Note : Above codes shown are for side cylinder ports without lights.

SOLENOID OPERATOR ➤

XX	Voltage	Y	Manual operator
11	120/60, 110/50	1	Non-locking
12	240/60, 220/50	2	Locking
22	24/60, 24/50		
59	2A VDC (2.5 W)		
87	2A VDC (17.1 W)		
61	2A VDC (8.5 W)		

- Other options available, see page 349.

OPTIONS

631D-XXX-PM-xxTDA

- For piped pilot exhaust replace M by P.
- For bottom cylinder ports, replace by 4 (no light), by 5 (sgl. light), by 6 (dbl. light).
- For side cylinder ports with light, replace by 2 (sgl. light), by 3 (dbl. light).
- For bottom and side cylinder ports, replace by 7 (no light), by 8 (sgl. light), by 9 (dbl. light).
- For lights on valve body, replace by 3.
- For dual pressure valves with lights on valve body (see page 293 for use with sandwich regulators), replace by 6.

MODIFICATIONS - MOD 0210 Bottom inlet port in addition to side inlet port - TO ORDER: 6311D-511-PM-111 DA MOD 0210

- Note :
- The valve less base is always the same for internal or external pilot. These options are effected in the manifold.
 - To order manifolds without the valve, choose the manifold from the above table, then add 6300D as a prefix. Example 6300D-511.
 - When ordering an external pilot connection for manifold bases, a common external pilot port is required for all the valves in the manifold whether single or double solenoid.
 - Manifolds for solenoid and remote air operated valves must be ganged separately.

TECHNICAL DATA

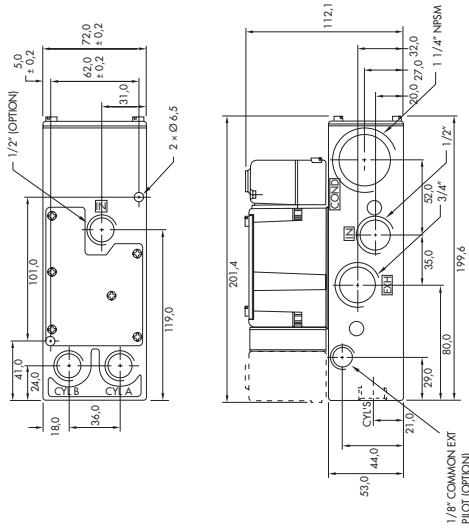
Fluid :	Compressed air, vacuum, inert gases
Pressure range :	Internal pilot : single operator and 3 positions : 25-150 PSI double operator : 10-150 PSI External pilot : vacuum to 150 PSI
Pilot pressure :	Single operator and 3 positions : 25-150 PSI Double operator : 10-150 PSI
Lubrication :	Not required, if used select a medium aniline point lubricant (between 180°F to 210°F)
Filtration :	40 µ
Temperature range :	0°F to 120°F (−18°C to 50°C)
Flow (at 6 bar, ΔP=1bar) :	3/8" : (2.6 Cv), 1/2" (3.0 Cv)
Leak rate :	100 cm ³ /min
Coil :	Epoxy encapsulated - class A wires - Continuous duty.
Voltage range :	−15% to +10% of nominal voltage
Protection :	Consult factory
Power :	−Inrush : 14.8 VA Holding : 10.9 VA = 1 to 17.1 W
Response times :	24 VDC (8.5 W) Energize : 10 ms De-energize : 11 ms 120/60 Energize : 4-13 ms De-energize : 10-17 ms

- Spare parts :
- Solenoid operator (power ≥ 4 W): D1-XXBE cover mounting screws 35206 and seal 16234.
 - Pilot valve : PMEXXXDAE, including seal 16337. • Pressure seal between valve and base : 16396.
 - Mounting screw valve to base (M4) : 35303. • Nitril (K2) : 19624. • Fastening kit : N63002-01
 - Nitril isolator : 32839. • Exhaust isolator : 28309. • Blank station cover plate : M6301-4.

- Options :
- ESPP threads.

DIMENSIONS

Dimensions shown are metric (mm)



6.8 VALVES SERIES N (PARKER)

Location	Item	ECL Code	Reference	Coil	Seals kit
filling sealing	D.4.	1-10-039-97	N3 55 N 8 045 49	0-08-325-74	/
Hopper fluidization	H.2	1-10-039-97	N3 55 N 8 045 49	0-08-325-74	/
Crust breaker	J.2	1-10-250-48	N3 55 7 8 045 49	0-08-325-74	0-09-325-67
Butt / bath grab	S.3	1-10-372-67	N3 25 8 5 002 49	0-09-325-53	0-09-325-39

NON CONTRACTUAL VIEW



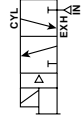
VALVES SERIES N



Basic Valve Functions.....	2	Coil Information.....	14
"N" Series Basic Features.....	3	Time Delay Modules.....	15
Common Part Numbers.....	4-5	Dimensions.....	16-20
Model Number Index.....	6-7	Single Solenoid.....	16-20
Technical Information.....		Remote Operated.....	21-22
Pilot Supply.....	8-9		
Electrical Connections.....	10		
Solenoid Characteristics.....	11		
Solenoid & Parts Lists.....	12-13		

Bold text part numbers are standard.
Standard text part numbers may have longer lead times.

**Single Solenoid
3-Way, 2-Position
Normally Closed**

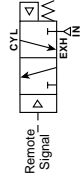


Normal position – Pressure at inlet port marked "IN" blocked. Cylinder port connected to exhaust port (3-Way).
Energized position – Solenoid operator energized, pressurized "IN" port connects to cylinder port. Exhaust port is blocked (3-Way).

CAUTION:
These are poppet valves, **Do Not** restrict the inlet.

Note: For 2-Way, Normally Closed, Exhaust Port is Plugged.

**Single Remote Pilot
3-Way, 2-Position,
Normally Closed**

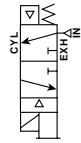


Normal position – Pressure at inlet port marked "IN" blocked. Cylinder port connected to exhaust port (3-Way).
Operated position – With maintained air signal at pilot port, pressurized "IN" port connects to cylinder port. Exhaust port is blocked (3-Way).

CAUTION:
These are poppet valves, **Do Not** restrict the inlet.

Note: For 2-Way, Normally Closed, Exhaust Port is Plugged.

**Single Solenoid
3-Way, 2-Position
Normally Open**

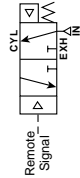


Normal position – Pressure at inlet port marked "IN" open to cylinder. Exhaust port is blocked (3-Way).
Energized position – Solenoid operator energized. Pressure at inlet port marked "IN" is blocked. Cylinder open to exhaust (3-Way).

CAUTION:
These are poppet valves, **Do Not** restrict the inlet.

Note: For 2-Way, Normally Open, Exhaust Port is Plugged.

**Single Remote Pilot
3-Way, 2-Position,
Normally Open**



Normal position – Pressure at inlet port marked "IN" open to cylinder. Exhaust port is blocked (3-Way).
Operated position – With maintained air signal at pilot port, pressure at inlet port marked "IN" is blocked. Cylinder open to exhaust (3-Way).

CAUTION:
These are poppet valves, **Do Not** restrict the inlet.

Note: For 2-Way, Normally Open, Exhaust Port is Plugged.

"N" Series

Specifications

- 2-Way NO & NC
- 3-Way NO & NC
- Selector Function

Flow

- 3/8" Body – 3.0 to 4.4 Cv
- 3/4" Body – 9.0 to 11.0 Cv
- 1-1/4" Body – 20.0 to 30.0 Cv

Port Sizes

- 3/8" Body – 1/4", 3/8", 1/2" NPT
- 3/4" Body – 1/2", 3/4", 1" NPT
- 1-1/4" Body – 1", 1-1/4", 1-1/2" NPT
- BSPP "G" Threads Available

Operating Pressure

- 30 to 250 PSI (0 to 1000 kPa)
- Vacuum with External Pilot

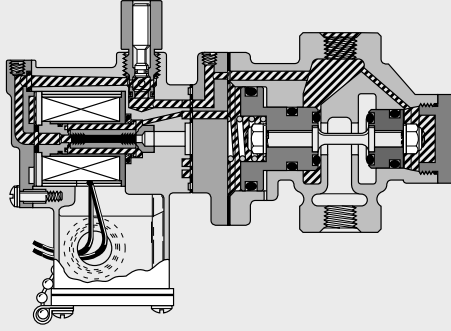
Features

- Continuous Duty Rated Option
- Non-Lube Service
- Hi-Flow, Short Stroke Poppet
- Indicator Lights Available

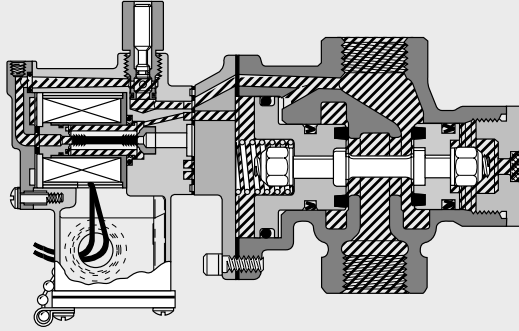
Certification / Approval

- Approved to be CE Marked (Standard L-Pilot & P-Pilot)
- NEMA 4 Option
- Hazardous Duty Option

3/8" Solenoid Pilot De-Energized
Normally Closed



1-1/4" Solenoid Pilot De-Energized
Normally Open



■ Pressure □ Exhaust

Single Solenoid Normally Closed 2-Way, 2-Position 3-Way, 2-Position



3/8" & 3/4" Body Size

	2-Way Normally Closed	3-Way Normally Closed	In/Cyl Ports	Exh. Port
3/8"	N315 29 045 53 N315 39 045 53 N315 49 045 53	N355 29 045 53 N355 39 045 53 N355 49 045 53	1/4" 3/8" 1/2"	3/8" 1/2" 1/2"
3/4"	N315 59 045 53 N315 69 045 53 N315 79 045 53	N355 59 045 53 N355 69 045 53 N355 79 045 53	1/2" 3/4" 1"	3/4" 1" 1"

Locking Manual Override, Internal Pilot 140 PSI,
Junction Box w/ Light, 120VAC.

Single Solenoid Normally Open 2-Way, 2-Position 3-Way, 2-Position



3/8" & 3/4" Body Size

	2-Way Normally Open	3-Way Normally Open	In/Cyl Ports	Exh. Port
3/8"	N335 29 045 53 N335 39 045 53 N335 49 045 53	N375 29 045 53 N375 39 045 53 N375 49 045 53	1/4" 3/8" 1/2"	3/8" 1/2" 1/2"
3/8"	N335 59 045 53 N335 69 045 53 N335 79 045 53	N375 59 045 53 N375 69 045 53 N375 79 045 53	1/2" 3/4" 1"	3/4" 1" 1"

Locking Manual Override, Internal Pilot 140 PSI,
Junction Box w/ Light, 120VAC.

1-1/4" Body Size

	2-Way Normally Closed	3-Way Normally Closed	In/Cyl Ports	Exh. Port
1-1/4"	N325 79 047 53 N325 89 047 53 N325 99 047 53	N365 79 047 53 N365 89 047 53 N365 99 047 53	1" 1-1/4" 1-1/2"	1-1/4" 1-1/2" 1-1/2"

Locking Manual Override, Internal Pilot 125 PSI,
P-Pilot Junction Box w/ Light, 120VAC.

1-1/4" Body Size

	2-Way Normally Open	3-Way Normally Open	In/Cyl Ports	Exh. Port
1-1/4"	N345 79 047 53 N345 89 047 53 N345 99 047 53	N385 79 047 53 N385 89 047 53 N385 99 047 53	1" 1-1/4" 1-1/2"	1-1/4" 1-1/2" 1-1/2"

Locking Manual Override, Internal Pilot 125 PSI,
P-Pilot Junction Box w/ Light, 120VAC.

"N" Series

BOLD OPTIONS ARE STANDARD

Basic Series

N

Function

315

Port Size

3

Solenoid Configuration

9

Pilot Option

0

Pilot Supply

45

Voltage

53

Options

L

Function

315 3/8" & 3/4" Body
315 2-Way, Normally Closed
335 2-Way, Normally Open
355 3-Way, Normally Closed
375 3-Way, Normally Open
1-1/4" Body
325 2-Way, Normally Closed
345 2-Way, Normally Open
365 3-Way, Normally Closed
385 3-Way, Normally Open

Pilot Option

0 Standard
5" Hazardous Duty
8" NEMA 4 (Solenoid Only)
* Available in voltage codes 45, 49, 51, 53, and 57 only.
† Available with L-Pilot only.

Options

L 72" Leads
C* Chrysler Wiring
F* Ford Wiring
G* GM Wiring
* MUST be specified with Solenoid Configuration
E, F, J, M, N, P*

Voltage

Pilot AC DC
L P 60Hz 50Hz
41 41 24 22 6
42 42 24 22 6
43 43 24 22 6
45* 45 24 22 6
49 49 24 22 6
51* 51 24 22 6
53* 53 120 110 24
55 55 110 110 24
56 56 230 220 24
57* 57 240 220 24
79† 79† 230 220 24

Solenoid Configuration	
1 Solenoid	
2 Solenoid w/ NLMO	
3 Solenoid w/ LMO	
4 Junction Box	
5 Junction Box NLMO	
6 Junction Box LMO	
7 Junction Box w/ Light	
8 Junction Box NLMO w/ Light	
9 Junction Box LMO w/ Light	
E* 3-Pin Automotive – JIC, NLMO w/ Light	
F* 3-Pin Automotive – JIC, LMO w/ Light	
J* 4-Pin Automotive – JIC, NLMO w/ Light	
M* 4-Pin Automotive – JIC, LMO w/ Light	
N* 5-Pin Automotive – JIC, NLMO w/ Light	
P* 5-Pin Automotive – JIC, LMO w/ Light	

Port Size	
3/8" Body Size	
2 1/4" Inlet & Cyl. – 3/8" Exhaust, NPT	
3 3/8" Inlet & Cyl. – 1/2" Exhaust, NPT	
4 1/2" Inlet & Cyl. – 1/2" Exhaust, NPT	
L* 1/4" Inlet & Cyl. – 3/8" Exhaust, BSPP "G"	
M* 3/8" Inlet & Cyl. – 1/2" Exhaust, BSPP "G"	
N* 1/2" Inlet & Cyl. – 1/2" Exhaust, BSPP "G"	
3/4" Body Size	
5 1/2" Inlet & Cyl. – 3/4" Exhaust, NPT	
6 3/4" Inlet & Cyl. – 1" Exhaust, NPT	
7 1" Inlet & Cyl. – 1" Exhaust, NPT	
P* 1/2" Inlet & Cyl. – 3/4" Exhaust, BSPP "G"	
Q* 3/4" Inlet & Cyl. – 1" Exhaust, BSPP "G"	
R* 1" Inlet & Cyl. – 1" Exhaust, BSPP "G"	
1-1/4" Body Size	
7 1" Inlet & Cyl. – 1-1/4" Exhaust, NPT	
8 1-1/4" Inlet & Cyl. – 1-1/2" Exhaust, NPT	
9 1-1/2" Inlet & Cyl. – 1-1/2" Exhaust, NPT	
R* 1" Inlet & Cyl. – 1-1/4" Exhaust, BSPP "G"	
S* 1-1/4" Inlet & Cyl. – 1-1/2" Exhaust, BSPP "G"	
T* 1-1/2" Inlet & Cyl. – 1-1/2" Exhaust, BSPP "G"	

Pilot Supply	
External Pilot Supply	
01 L-Pilot, 140 PSI	
02* P-Pilot, 125 PSI	
03 L-Pilot, 200 PSI	
04 L-Pilot – Continuous Duty, 140 PSI	
35 L-Pilot, 140 PSI w/ Switch Reactor	
36 L-Pilot, 200 PSI w/ Switch Reactor	
37* P-Pilot, 125 PSI w/ Switch Reactor	
38 L-Pilot – Continuous Duty, 140 PSI w/ Switch Reactor	
Internal Pilot Supply	
45 L-Pilot Operator, 140 PSI	
46 L-Pilot Operator, 200 PSI	
47* P-Pilot, 125 PSI	
48 L-Pilot – Continuous Duty, 140 PSI	
79 L-Pilot, 140 PSI w/ Switch Reactor	
80 L-Pilot, 200 PSI w/ Switch Reactor	
81* P-Pilot, 125 PSI w/ Switch Reactor	
82 L-Pilot – Continuous Duty, 140 PSI w/ Switch Reactor	

* Not available in Hazardous Duty or NEMA 4. Also see gray box.

L-Pilot Operator
Standard with the 3/8" & 3/4" body size. Optional with the 1-1/4" body size. Lighted options available with 120VAC and 24VDC. Available with Hazardous Duty or NEMA 4 classification (see model chart for options).

P-Pilot Operator
Standard with 1-1/4" body size. Not available with the 3/8" & 3/4" body size. Lighted options available with 120VAC. Not available with Hazardous Duty or NEMA 4 classification.

Single Remote Pilot Normally Closed

2-Way, 2-Position

3-Way, 2-Position



3/8" & 3/4" Body Size

	2-Way Normally Closed	3-Way Normally Closed	In/Cyl Ports	Exh. Port
3/8"	N314 21 091 N314 31 091 N314 41 091	N354 21 091 N354 31 091 N354 41 091	1/4" 3/8" 1/2"	3/8" 1/2" 1/2"
3/4"	N314 51 091 N314 61 091 N314 71 091	N354 51 091 N354 61 091 N354 71 091	1/2" 3/4" 1"	3/4" 1" 1"

1/4" NPT Remote Pilot Port with Internal Pilot Return.

Single Remote Pilot Normally Open

2-Way, 2-Position

3-Way, 2-Position



3/8" & 3/4" Body Size

	2-Way Normally Open	3-Way Normally Open	In/Cyl Ports	Exh. Port
3/8"	N334 21 091 N334 31 091 N334 41 091	N374 21 091 N374 31 091 N374 41 091	1/4" 3/8" 1/2"	3/8" 1/2" 1/2"
3/4"	N334 51 091 N334 61 091 N334 71 091	N374 51 091 N374 61 091 N374 71 091	1/2" 3/4" 1"	3/4" 1" 1"

1/4" NPT Remote Pilot Port with Internal Pilot Return.

1-1/4" Body Size

	2-Way Normally Closed	3-Way Normally Closed	In/Cyl Ports	Exh. Port
1-1/4"	N324 71 091 N324 81 091 N324 91 091	N364 71 091 N364 81 091 N364 91 091	1" 1-1/4" 1-1/2"	1-1/4" 1-1/2" 1-1/2"

1/4" NPT Remote Pilot Port with Internal Pilot Return.

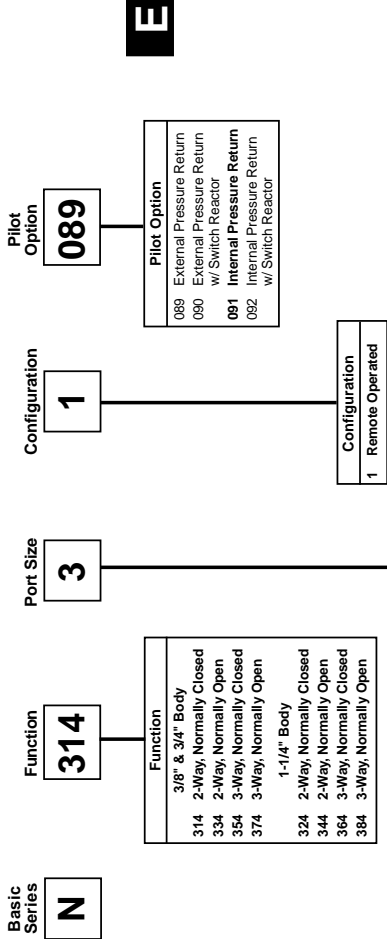
1-1/4" Body Size

	2-Way Normally Open	3-Way Normally Open	In/Cyl Ports	Exh. Port
1-1/4"	N344 71 091 N344 81 091 N344 91 091	N384 71 091 N384 81 091 N384 91 091	1" 1-1/4" 1-1/2"	1-1/4" 1-1/2" 1-1/2"

1/4" NPT Remote Pilot Port with Internal Pilot Return.

"N" Series

BOLD OPTIONS ARE STANDARD



E

Port Size	
3/8" Body Size	
2	1/4" Inlet & Cyl. – 3/8" Exhaust, NPT
3	3/8" Inlet & Cyl. – 1/2" Exhaust, NPT
4	1/2" Inlet & Cyl. – 1/2" Exhaust, NPT
L	1/4" Inlet & Cyl. – 3/8" Exhaust, BSPP "G"
M	3/8" Inlet & Cyl. – 1/2" Exhaust, BSPP "G"
N	1/2" Inlet & Cyl. – 1/2" Exhaust, BSPP "G"
3/4" Body Size	
5	1/2" Inlet & Cyl. – 3/4" Exhaust, NPT
6	3/4" Inlet & Cyl. – 1" Exhaust, NPT
7	1" Inlet & Cyl. – 1" Exhaust, NPT
P	1/2" Inlet & Cyl. – 3/4" Exhaust, BSPP "G"
Q	3/4" Inlet & Cyl. – 1" Exhaust, BSPP "G"
R	1" Inlet & Cyl. – 1" Exhaust, BSPP "G"
1-1/4" Body Size	
7	1" Inlet & Cyl. – 1-1/4" Exhaust, NPT
8	1-1/4" Inlet & Cyl. – 1-1/2" Exhaust, NPT
9	1-1/2" Inlet & Cyl. – 1-1/2" Exhaust, NPT
R	1" Inlet & Cyl. – 1-1/4" Exhaust, BSPP "G"
S	1-1/4" Inlet & Cyl. – 1-1/2" Exhaust, BSPP "G"
T	1-1/2" Inlet & Cyl. – 1-1/2" Exhaust, BSPP "G"

Operating Pressure

Internal Pilot – Solenoid Valves

- 3/8" & 3/4" Body
- 20 to 140 PSIG (standard)
- 1-1/4" Body
- 25 to 140 PSIG (200 PSIG option available)

Internal Pilot – Remote Pilot Valve

Operating Pressure Limitations				
Air Pressure Thru Valve	Remote Pilot Pressure (PSI)			
	3/8" Basic	3/4" Basic	1-1/4" Basic	30-250
25 PSI	30-250	30-250	30-250	30-250
50 PSI	50-250	50-250	50-250	50-250
75 PSI	70-250	75-250	70-250	70-250
100 PSI	95-250	95-250	90-250	90-250
150 PSI	140-250	145-250	130-250	130-250
200 PSI	175-250	185-250	175-250	175-250
250 PSI	215-250	230-250	205-250	205-250

Solenoid Valves: External Supply

3/8" & 3/4" Basic

Air Pressure Thru Valve (PSI)	External Pilot Pressure Required (PSI)*	
	3/8" Basic	3/4" Basic
25 PSI	35-200	35-200
50 PSI	45-200	40-200
75 PSI	55-200	50-200
100 PSI	65-200	65-200
150 PSI	80-200	80-200
250 PSI	110-200	110-200

Vacuum up to 1" HG, less than a perfect vacuum.

*With 200 PSI option. Do not exceed 140 PSI with standard pilots.

1-1/4" Basic

Air Pressure Thru Main Valve (PSI)	External Pilot Pressure Required (PSI)	
	Normally-Closed	Normally-Open
25 PSI	30-125	40-125
50 PSI	35-125	50-125
75 PSI	45-125	70-125
100 PSI	55-125	85-125
150 PSI	75-125	125-125
200 PSI	105-125	–

Vacuum up to 1" HG, less than a perfect vacuum.

3/8" & 3/4" Body

1-1/4" Body

Single Solenoid External Pilot
Normally Closed

3/8" & 3/4" Body

1-1/4" Body

Single Solenoid External Pilot
Normally Open

3/8" & 3/4" Body

1-1/4" Body

Remote Operated External Return
Normally Closed

3/8" & 3/4" Body

1-1/4" Body

Remote Operated External Return
Normally Open

External Pilot supply should be used when the main valve needs to operate below the Minimum Operating Pressure or at Vacuum. A Selector function can also be achieved (pressurizing the IN and EXHAUST ports) with an External Pilot Supply. Refer to charts for required external pilot pressure.

Flow

Basic Valve Size	Inlet Port Size	Exhaust Port Size	Cv Inlet to Cylinder	Cv Cylinder to Exhaust
3/8" 3-Way Normally Closed	1/4" Pipe	3/8" Pipe	2.9	3.1
	3/8" Pipe	1/2" Pipe	3.6	4.2
	1/2" Pipe	1/2" Pipe	3.8	4.3
3/8" 3-Way Normally Open	1/4" Pipe	3/8" Pipe	2.9	3.0
	3/8" Pipe	1/2" Pipe	3.6	4.1
	1/2" Pipe	1/2" Pipe	3.9	4.5
3/4" 3-Way Normally Closed	1/2" Pipe	3/4" Pipe	8.2	9.2
	3/4" Pipe	1" Pipe	9.3	10.8
3/4" 3-Way Normally Open	1/2" Pipe	3/4" Pipe	7.7	6.6
	3/4" Pipe	1" Pipe	9.6	11.4
1-1/4" 3-Way Normally Closed	1" Pipe	1-1/4" Pipe	19.5	23.5
	1-1/4" Pipe	1-1/2" Pipe	23.3	26.9
	1-1/2" Pipe	1-1/2" Pipe	23.3	26.9
1-1/4" 3-Way Normally Open	1" Pipe	1-1/4" Pipe	20.4	24.8
	1-1/4" Pipe	1-1/2" Pipe	25.0	29.1

Temperature Rating

Operating Temperature Range:

Operator Type	Duty Cycle	Minimum Ambient Temperature	Maximum Ambient Temperature
Standard Service	Intermittent	0°F (-18°C)	125°F (52°C)
Solenoid	Continuous	0°F (-18°C)	100°F (38°C)
Special Service	Intermittent	0°F (-18°C)	125°F (52°C)
Solenoid	Continuous	0°F (-18°C)	125°F (52°C)
Remote Pilot	Not Applicable	0°F (-18°C)	200°F (93°C)

Applications with pilot valves energized for ten (10) minutes or longer with a duty cycle greater than 70% are considered to be continuously energized.

Duty cycle = $\frac{\text{Time energized}}{\text{Time energized} + \text{time off}} \times 100\% = \% \text{ Duty Cycle}$

Materials of Construction

Valve Body: Cast aluminum.

Poppet Assembly: Aluminum and stainless steel.

Pilot Valve: Zinc, Stainless Steel, Brass, Copper, Zinc Plated Steel

Seals: Nitrile

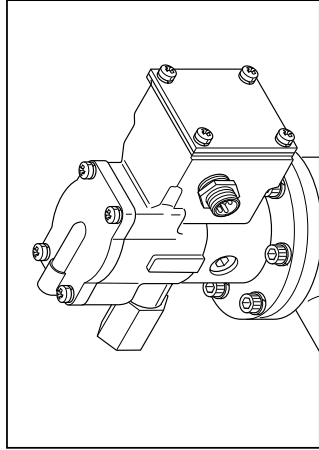
Switch Reactor

The switch reactor can be used as a valve position indicator or to actuate a sequence circuit or cycle counter.

Switch Forces that may be used with inline valves must not exceed:

- 3 pounds for 3/8" basic valves
- 4 pounds for 3/4" basic valves
- 5 pounds for 1-1/4" basic valves

Switch reaction forces beyond these maximums can prevent the valve from returning to the "fail safe" position in the event of air or electrical failure.



Automotive Connections

- 3-Pin & 5-Pin "Mini" (7/8 UNF Thread)
- 4-Pin "Micro" (M12 Thread)

Solenoid Configurations

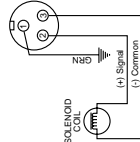
"E", "F", "J", "M", "N", "P"

Wiring Connections

Chrysler Connection (Straight)

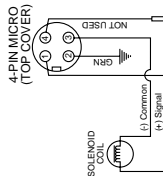
3-Pin Male/Single Solenoid

(Encl. Options E & F, Wiring Option C)



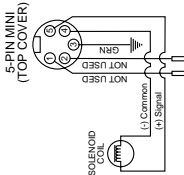
4-Pin Male/Single Solenoid

(Encl. Options J & M, Wiring Option C)



5-Pin Male/Single Solenoid

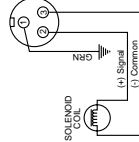
(Encl. Options N & P, Wiring Option C)



Ford Connection (Straight)

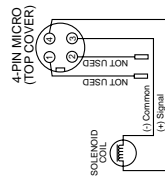
3-Pin Male/Single Solenoid

(Encl. Options E & F, Wiring Option F)



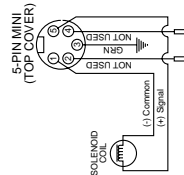
4-Pin Male/Single Solenoid

(Encl. Options J & M, Wiring Option F)



5-Pin Male/Single Solenoid

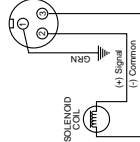
(Encl. Options N & P, Wiring Option F)



GM Connection (Straight)

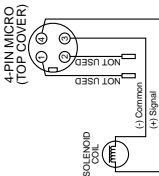
3-Pin Male/Single Solenoid

(Encl. Options E & F, Wiring Option G)



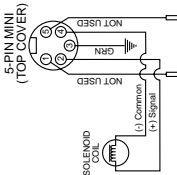
4-Pin Male/Single Solenoid

(Encl. Options J & M, Wiring Option G)



5-Pin Male/Single Solenoid

(Encl. Options N & P, Wiring Option G)



Solenoid Characteristics Chart

Voltage Range +10%-15% of Nominal

3/8" & 3/4" Basic - L-Pilot				
Voltage/ Cycles	Amps Inrush	Amps Holding	Resistance Ohms	Insulation Class
120/60VAC	.29	.18	122	12
110/50VAC	.21	.14	122	12
240/60VAC	.18	.12	610	12
24/60VAC	1.6	1.0	4.5	9.5
24/50VAC	1.2	.75	6.4	9.5
6VDC	-	1.4	4.5	7.6
12VDC	-	.66	17.7	9
24VDC	-	.32	71	9
48VDC	-	.22	216	11

1-1/4" Basic - P-Pilot				
Voltage/ Cycles	Amps Inrush	Amps Holding	Resistance Ohms	Insulation Class
120/60VAC	.46	.25	35	18.5
110/50VAC	.36	.19	48	12
230/60VAC	.26	.15	125	19.5
220/50VAC	.20	.11	191	15
24/60VAC	2.3	1.4	1.3	20
24/50VAC	1.6	.9	2.1	12
12VDC	-	.7	17	8
24VDC	-	.33	68	8
48VDC	-	.16	275	7.5

NOTE: Continuous duty type service is for applications where pilot valve is energized more than ten (10) minutes.

Hazardous Duty Solenoid Listing

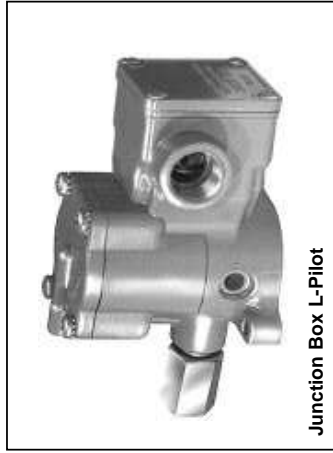
Valves with solenoid operators designed for hazardous locations are UL & CSA Approved as follows:

National Electric Code	Ambient Conditions	NEMA Classification
Class I Div. 1 Group C	Ethyl Ether, Etc. Gases & Vapors	VII (7)
Class I Div. 1 Group D	Gasoline, Etc. Gases & Vapors	VII (7)
Class I Div. 2 Group B	Butadiene, Etc., Liquid, Fluid or Vapor Normally Contained, or Atmosphere Ventilated	VII (7)
Class II Div. 1 Group E	Metal Dust	IX (9)
Class II Div. 1 Group F	Coal, Coke, Carbon Black Dust	IX (9)
Class II Div. 1 Group G	Flour, Starch, Grain Dust	IX (9)

See Article 500 - Hazardous (Classified) Locations, National Electric Code.



Basic L-Pilot

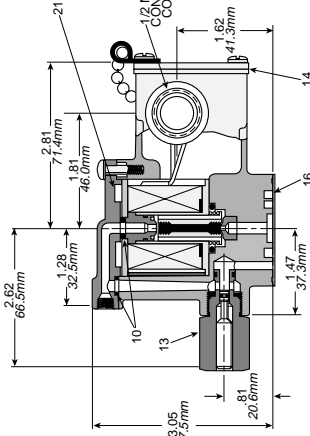


Junction Box L-Pilot

Replacement Pilots

Description		Standard L-Pilot		Continuous Duty L-Pilot	
Override Type	Locking	Non-Locking	Non-Locking	Locking	Non-Locking
Basic with Override	K065 3035**	K065 2035**	K065 3035**	K085 2025**	K085 2025**
JIC with Junction Box & Override	K065 6035**	K065 5035**	K065 6035**	K085 5025**	K085 5025**
JIC Pilot with Junction Box & Override & Indicator Lights (120VAC Only)	K065 9035**	K065 8035**	K065 9035**	K085 8025**	K085 8025**

** Voltage Code



Continuous Duty Pilot Only

Parts List

Item No.	Part Number	Description
4	K593 025	Coil 120V 60Hz / 110V 50Hz
	K593 035	Coil 240V 60Hz / 220V 50Hz
	K593 003	Coil 6VDC / 12V 60Hz
	K593 010	Coil 12VDC
	K593 014	Coil 24VDC
5	K593 041	Coil 120VDC
	H142 13	Seal
6	K423 006	Top Seat
	K423 010	Top Seat (SPL Service Pilot)
8	K343 002	Plunger (STD. Service)
	K343 001	Plunger (Continuous Duty)
*10	H142 01	Seal
*11	H249 69	O-Ring

Coil leads are 19" long.

* Parts included in Service Kit
Continuous Duty Kit K352 366
Standard Service Kit K352 186

Item No.	Part Number	Description
12	K272 004	Plunger Guide
13	K152 003	Override Assembly
*14	K183 047	Cover Gasket
*16	K183 001	Gasket
*18	H134 73	O-Ring
*20	H134 13	O-Ring
*21	H147 01	Shock Pad
*22	H191 02	120 AC Only - Indicator Light
24	K183 108	Gasket



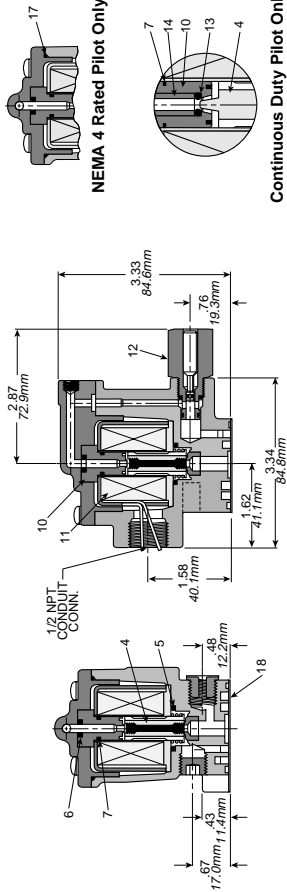
Hazardous Duty L-Pilot



NEMA 4 L-Pilot

Replacement Pilots

Description	Standard L-Pilot	Continuous Duty L-Pilot
Hazardous Duty L-Pilot - UL & CSA	K025 1035**	K045 1025**
NEWA 4 L-Pilot	K235 1035**	K255 1025**
Override Type	Locking	Locking
Hazardous Duty with Override	K025 3035***	K045 3025**
NEWA 4 with Override	K235 3035***	K255 3025**
		K255 2025**

**** Voltage Code**

NEMA 4 Rated Pilot Only

Continuous Duty Pilot Only

Parts List

Item No.	Part Number	Description
* 4	K343 002	Plunger (STD. Service)
* 5	K343 001	Plunger (Continuous Duty)
	K142 13	Seal
* 6	H134 11	O-Ring
	H134 61	O-Ring (STD. Service)
* 7	H249 69	O-Ring (SPL. Service)
	K423 001	Top Seat
10	K423 002	Top Seat (SPL. Service)
	K593 025	Coil 120V 60Hz / 110V 50Hz
	K593 035	Coil 240V 60Hz / 220V 50Hz
	K593 003	Coil 6VDC / 12V 60Hz
11	K593 010	Coil 12VDC
	K593 014	Coil 24VDC
	K593 041	Coil 120VDC

Item No.	Part Number	Description
12	K152 003	Override Assembly
* 13	H134 73	O-Ring
* 17	H137 16	Gasket (NEIMA 4 Rated Pilot Only)
* 18	K183 001	Gasket

Coil leads are 19" long.

* Parts included in Service Kit.

Continuous Duty Kit K352 366

Standard Service Kit K352 166

Coils for L-Pilot Operated Valves

Voltage Code **	Voltage		DC	Coil	
	60Hz	50Hz		19" Leads	72" Leads
40	12	—	—	K593007	K593178
41	24	41.42	6	K593003	K593179
43	—	24	—	K593015	K593181
46	—	36	—	K593016	K593183
45†	—	—	12	K593010	K593182
49†	—	—	24 (Standard)	K593014	K593184
79	—	—	24 (Arc Suppressed)	K593271	K593272
51†	—	51	48	K593028	K593185
53†	120	110	—	K593025	K593186
57†	240	220	—	K593035	K593187
59	—	240	—	K593033	K593188
61	—	—	90	K593020	K593189
60	—	—	120	K593041	K593190
62	—	380	—	K593038	K593191

Coils for P-Pilot Operated Valves

Voltage Code **	Voltage		DC	Coil	
	60Hz	50Hz		19" Leads	72" Leads
39	—	12	—	K593095	K593255
40	12	—	—	K593096	K593256
41	—	—	6	K593092	K593257
42	24	—	—	K593099	K593258
43	—	24	—	K593098	K593259
45	—	—	12	K593094	K593260
49	—	—	24	K593097	K593261
51	—	—	48	K593102	K593254
53	115	—	—	K593108	K593262
54	—	110	—	K593106	K593263
56	230	—	—	K593112	K593264
58	—	230	—	K593111	K593265
61	—	—	115	K593107	K593266

[illegible]

Voltage Code

"N" Series Valves
Inline Poppet Valves - 3/8" & 3/4"

Time Delay Modules

Time Delay Modules Provide:

- Delay of valve action upon application of control signal, removal of control signal or both application and removal of control signal.
- Delay intervals from 0-6, 5-12 or 10-30 seconds ... up to several minutes with the addition of a small external reservoir.
- Repeatability within 10%, using clean filtered air
- Change of function without disassembly ... with line pressure on the valve.

Function

Time delay to be used with **external pressure return** valve only.

Time delay modules provide precise, consistent delay of valve shift. They eliminate the need for electrical timers and relays and simplify circuitry.

Delay interval is controlled by an externally adjustable metering screw. Change of function is accomplished by loosening two lock screws, turning the slotted selector plate to the desired function and re-tightening the lock screws. By adding a small external reservoir, delay interval can be extended up to several minutes.

Setting Selector for Desired Function

For valves which are solenoid pilot operated, or valves being controlled by normally open remote pilot, match the pointer marker "Elect" with the desired function indicator line.

For valves which are being controlled by normally closed pilot, match the pointer marked "Air" with the desired function indicator line.

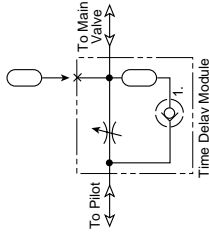
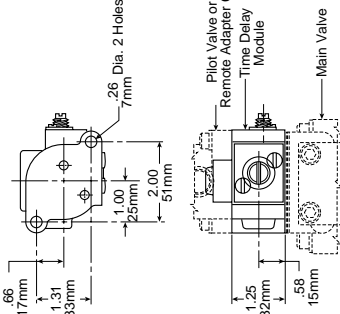
How to Order

To order time delay module assembled with **remote operated valve**, insert the appropriate 3-digit code in place of the "xxx" at the end of the valve model number.

Body Size	2-Way		3-Way	
	Normally Closed	Normally Open	Normally Closed	Normally Open
3/8"	1/4" N314-21-xxx	N334-21-xxx	N354-21-xxx	N374-21-xxx
	3/8" N314-31-xxx	N334-31-xxx	N354-31-xxx	N374-31-xxx
	1/2" N314-41-xxx	N334-41-xxx	N354-41-xxx	N374-41-xxx
3/4"	1/2" N314-51-xxx	N334-51-xxx	N354-51-xxx	N374-51-xxx
	3/4" N314-61-xxx	N334-61-xxx	N354-61-xxx	N374-61-xxx
	1" N314-71-xxx	N334-71-xxx	N354-71-xxx	N374-71-xxx

Delay Module Code

Delay Interval	3-Digit Code
0-6 Seconds	099
5-12 Seconds	100
10-30 Seconds	101



1. Time Delay After Application of Signal to Solenoid (Elect. Pointer)
2. Time Delay After Removal of Signal From Solenoid.
3. Time Delay After Application and Removal of Signal to Solenoid.

How to Order Kits

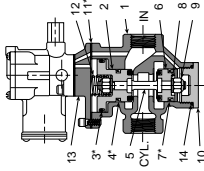
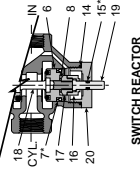
Kits are suitable for both solenoid and remote operated valves. Kits include module, gaskets, screws, and installation instructions.

Delay Interval	Module Kit Number
0-6 Seconds	K705 1001
5-12 Seconds	K705 1002
10-30 Seconds	K705 1003

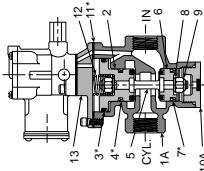
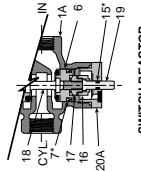
"N" Series Valves
Internal Pilot - 3/8" & 3/4" Basic Body

Dimensions - Single Solenoid

Normally Closed



Normally Open



Exhaust
Pressure

Top view indicates flow through 3-Way valve with coil de-energized.
NOTE: For normal valve operation, override must be in "out" position.

Dimensions

Key	3/8" Body		3/4" Body	
	Inch	mm	Inch	mm
A	1.56	40	2.13	54
B	1.50	38	1.94	49
C	1.81	46	1.34	34
D	.56	14	.56	14
E	3/8-16UNC 7/16" deep		3/8-16UNC 9/16" deep	
F	1.75	44	2.25	57
G	1.50	38	1.50	38
H	5.92	150	7.14	181
J	3.19	81	3.75	95
K	1.88	47	2.44	62
L	.11	3	.16	4
M	.50	13	.50	13
N	1.44	37	1.78	45
P	7.36	196	8.58	218
Q	2.31	59	3.09	84
R	7.92	201	8.83	224

Service Kits

Include all parts normally required for in-service maintenance:

- 3/8" Basic Valve with standard service L-Pilots **K352 076**
- 3/8" Basic Valve with continuous duty L-Pilots **K352 276**
- 3/4" Basic Valve with standard service L-Pilots **K352 077**
- 3/4" Basic Valve with continuous duty L-Pilots **K352 277**

Key	3/8" Valve	3/4" Valve	Part
1	1/2" Tap K053 021	3/4" Tap K053 075	Body (N.C.)
	3/8" Tap K053 022	3/4" Tap K053 076	
	1/2" Tap K053 023	3/4" Tap K053 220	
	1/4" Tap K053 024	3/4" Tap K053 077	
	3/8" Tap K053 025	3/4" Tap K053 078	Body (N.O.)
	1/2" Tap K053 026	3/4" Tap K053 218	
	K212 001	K212 002	Upper Piston Assy
	H136 48	H137 28	Seal
	H145 10	H136 76	U-Cup (3/8), O-Ring (3/4)
	K493 002	K493 009	Stem
6	K202 001	K202 002	Lower Piston Assy.

Key	3/8" Valve	3/4" Valve	Part
* 7	H145 09	H136 76	U-Cup (3/8), O-Ring (3/4)
8	H178 11	H178 13	Washer (2)
9	H063 26	H063 32	Stop Nut (2)
10	K103 035	K103 053	Bottom Cap (N.C.)
10A	K092 020	K092 034	Bottom Cap Assy. (N.O.)
* 11	K183 049	K183 057	Gasket
12	K473 014	K473 015	Spring
13	K563 015	K563 017	Adapter
* 14	H136 03	H136 41	O-Ring
* 15	H134 11	H134 11	O-Ring
16	K293 001	K573 001	Collar
17	K293 004	K293 003	Lock Nut
18	K493 002	K493 009	Stem (Switch Reactor)
19	K343 066	K343 066	Plunger
20	K103 038	K103 058	Bottom Cap (N.C.)
20A	K092 037	K092 036	Bottom Cap Assy. (N.O.)

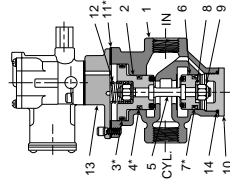
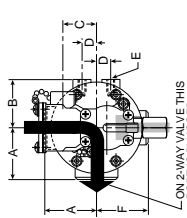
* Parts included in seal kit

"N" Series Valves External Pilot - 3/8" & 3/4" Basic Body

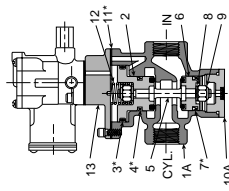
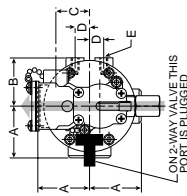
Normally Closed

Exhaust
Pressure

Top view indicates flow through
3-Way valve with coil de-energized.
NOTE: For normal valve operation,
override must be in "out" position.



Normally Open



Dimensions

Key	3/8" Body Inch	3/4" Body Inch	mm
A	1.56	40	2.13
B	1.88	38	1.94
C	1.81	46	1.34
D	.56	14	.56
E	3/8-16UNC 7/16" deep	3/8-16UNC 9/16" deep	
F	1.75	44	2.25
G	1.50	38	1.50
H	6.42	163	7.45
J	3.19	81	3.75
K	1.88	48	2.44
N	1.44	37	1.78
P	7.86	200	8.89
Q	2.31	59	3.09
R	4.34	110	5.38

Service Kits

Include all parts normally required for
in-service maintenance:

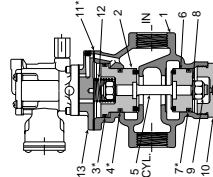
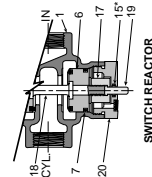
3/8" Basic Valve with standard service L-Pilots.....	K352 076
3/8" Basic Valve with continuous duty L-Pilots.....	K352 276
3/4" Basic Valve with standard service L-Pilots.....	K352 077
3/4" Basic Valve with continuous duty L-Pilots.....	K352 277

"N" Series Valves Internal Pilot - 1-1/4" Basic Body

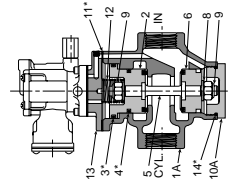
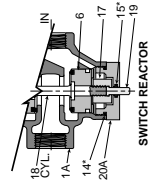
Normally Closed

Exhaust
Pressure

Top view indicates flow through
3-Way valve with coil de-energized.
NOTE: For normal valve operation,
override must be in "out" position.



Normally Open



Dimensions

Key	1-1/4" Body Inch	mm
A	3.00	76
B	2.25	57
C	2.94	75
D	1.19	30
E	1/2-13 UNC 3/4 Deep	
F	3.13	79
G	1.63	41
H	9.30	236
J	5.34	136
K	3.44	87
L	.25	6
M	.50	13
N	2.31	59
P	11.14	283
Q	4.56	116
R	11.48	292

Service Kits

Include all parts normally
required for in-service
maintenance:

1-1/4" Basic Valve with standard service L-Pilot.....	K352 078
---	-----------------

Key	Part Number	Part
1	1" Tap K053 111	Body (N.C.)
	1-1/4" Tap K053 112	
	1-1/2" Tap K053 113	
	1" Tap K053 114	
1A	1-1/4" Tap K053 115	Body (N.O.)
	1-1/2" Tap K053 116	
2	K313 029	Upper Piston
* 3	H137 52	O-Ring
* 4	H137 28	Seal
5	K493 016	Stem
	K313 028	Lower Piston

* Parts included in seal kit

Key	Part Number	Part
* 7	H137 28	Seal
8	H178 17	Washer
9	H063 38	Stop Nut
10	K092 046	Bottom Cap (N.C.)
10A	K103 061	Bottom Cap (N.O.)
* 11	K183 058	Gasket
12	K473 016	Spring
13	K012 003	Adapter
* 14	H137 49	O-Ring
* 15	H134 20	O-Ring
17	K293 008	Lock Nut
18	K493 016	Stem (Switch Reactor)
19	K343 008	Plunger
20	K092 039	Bottom Cap Assy. (N.C.)
20A	K103 060	Bottom Cap (N.O.)

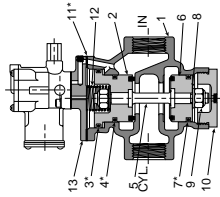
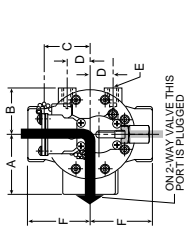
* Parts included in seal kit.

"N" Series Valves
Dimensions - Single Solenoid

Normally Closed

Exhaust
Pressure

Top view indicates flow through
3-Way valve with coil de-energized.
NOTE: For normal valve operation,
override must be in "out" position.



Normally Open

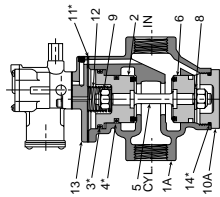
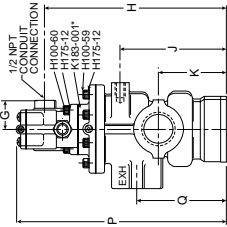
E

Dimensions

Key	1-1/4" Body	mm
A	3.00	76
B	2.25	57
C	1.34	34
D	1.19	30
E	1/2-13 UNC 3/4 Deep	
F	3.13	80
G	1.50	38
H	9.02	229
J	5.34	136
K	3.44	87
N	2.31	59
P	10.45	265
Q	4.56	116

Service Kits

Include all parts normally
required for in-service
maintenance:
1-1/4" Basic Valve
with continuous
duty L-Pilot **K352 080**



Key	Part Number	Part
1	K053 111	1" Tap
	K053 112	1-1/4" Tap
	K053 113	1-1/2" Tap
	K053 114	2" Tap
1A	K053 115	1-1/4" Tap
	K053 116	1-1/2" Tap
	K053 117	2" Tap
	K053 118	2-1/2" Tap
2	K313 029	Upper Piston
* 3	H137 52	O-Ring

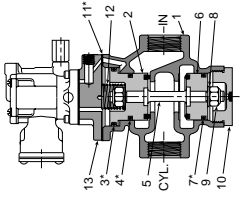
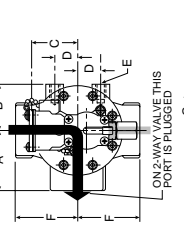
* Parts included in seal kit.

"N" Series Valves
Dimensions - Single Solenoid

Normally Closed

Exhaust
Pressure

Top view indicates flow through
3-Way valve with coil de-energized.
NOTE: For normal valve operation,
override must be in "out" position.



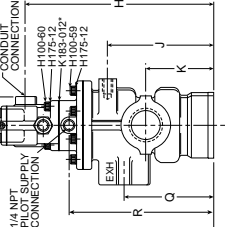
Normally Open

Dimensions

Key	1-1/4" Body	mm
A	3.00	76
B	2.25	57
C	2.31	59
D	1.19	30
E	1/2-13 UNC 3/4 Deep	
F	3.13	79
G	1.63	41
H	9.67	246
J	5.34	136
K	3.44	87
N	2.31	59
P	11.52	293
Q	4.56	116
R	7.31	186

Service Kits

Include all parts normally
required for in-service
maintenance:
1-1/4" Basic Valve
with continuous
duty L-Pilot **K352 080**



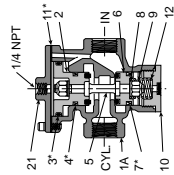
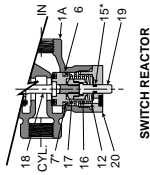
Key	Part Number	Part
1	K053 143	1" Tap
	K053 144	1-1/4" Tap
	K053 145	1-1/2" Tap
	K053 146	2" Tap
1A	K053 147	1" Tap
	K053 148	1-1/4" Tap
	K053 149	1-1/2" Tap
	K053 150	2" Tap
2	K313 029	Upper Piston
* 3	H137 52	Seal

* Parts included in seal kit.

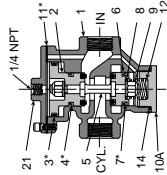
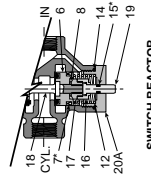
Dimensions - Remote Operated

Internal Return - 3/8", 3/4", 1-1/4" Basic Body

Normally Closed



Normally Open



Exhaust Pressure

Top view indicates flow through 3-Way valve with coil de-energized.
NOTE: For normal valve operation, override must be in "out" position.

Dimensions

Key	3/8" Body	3/4" Body	1-1/4" Body
	Inch	mm	Inch
	mm		mm
A	1.56	40	2.13
B	1.50	38	1.94
C	1.13	29	1.13
D	.56	14	.56
E	3/8-16UNC	3/8-16UNC	1/2-13UNC
F	7/16" deep	9/16" deep	3/4" deep
G	1.56	40	2.13
H	3.19	81	3.75
J	1.88	48	2.44
K	.50	13	.50
L	.11	3	.16
M	1.44	37	1.78
N	4.22	107	5.31
P	4.78	121	5.56
Q	2.31	59	3.09
			78
			4.56
			116

Service Kits

Include all parts normally required for in-service maintenance:

3/8" Basic Valve	K352 073
3/4" Basic Valve	K352 074
1-1/4" Basic Valve	K352 075

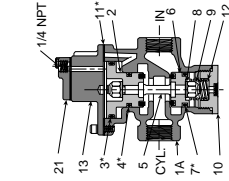
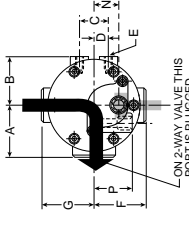
Key	3/8" Valve	3/4" Valve	1-1/4" Valve	Part
1	1/4" Tap K053 021	1/2" Tap K053 075	1" Tap K053 111	Body (N.O.)
	3/8" Tap K053 022	3/4" Tap K053 076	1-1/4" Tap K053 112	
	1/2" Tap K053 023	1" Tap K053 113	1-1/2" Tap K053 114	
	1/4" Tap K053 024	1/2" Tap K053 077	1" Tap K053 114	
1A	3/8" Tap K053 025	3/4" Tap K053 078	1-1/4" Tap K053 115	Body (N.C.)
	1/2" Tap K053 026	1" Tap K053 116	1-1/2" Tap K053 117	
2	K212 001	K212 002	K313 029	Upper Piston Assy
*3	H136 48	H137 28	H137 52	Seal
*4	K493 002	K493 009	K493 016	Stem
5	K493 002	K493 009	K493 016	Stem
6	K202 001	K202 002	K313 028	Lower Piston Assy

* Parts included in seal kit

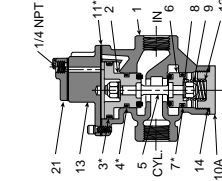
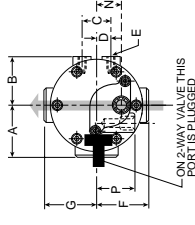
Dimensions - Remote Operated

External Return - 3/8", 3/4", 1-1/4" Basic Body

Normally Closed



Normally Open



Exhaust Pressure

Top view indicates flow through 3-Way valve with coil de-energized.
NOTE: For normal valve operation, override must be in "out" position.

Dimensions

Key	3/8" Body	3/4" Body	1-1/4" Body
	Inch	Inch	Inch
	mm	mm	mm
A	1.56	40	2.13
B	1.50	38	1.94
C	1.13	29	1.13
D	.56	14	.56
E	3/8-16UNC	3/8-16UNC	1/2-13UNC
F	7/16" deep	9/16" deep	3/4" deep
G	1.56	40	2.13
H	3.19	81	3.75
J	1.88	48	2.44
K	.50	13	.50
L	.11	3	.16
M	1.44	37	1.78
N	4.22	107	5.31
P	4.78	121	5.56
Q	2.31	59	3.09
			78
			4.56
			116

Service Kits

Include all parts normally required for in-service maintenance:

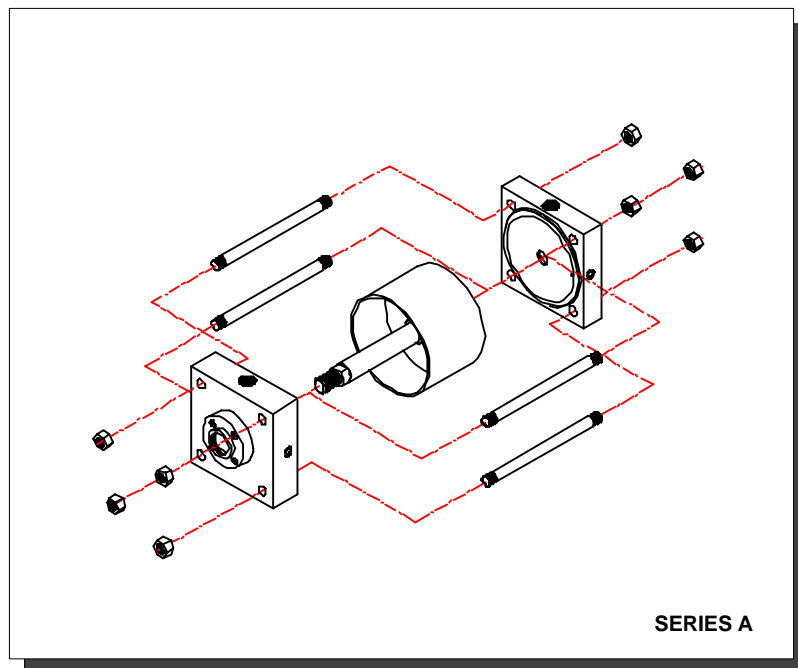
3/8" Basic Valve	K352 031
3/4" Basic Valve	K352 056
1-1/4" Basic Valve	K352 083

Key	3/8" Valve	3/4" Valve	1-1/4" Valve	Part
1	1/4" Tap K053 011	1/2" Tap K053 067	1" Tap K053 143	Body (N.O.)
	3/8" Tap K053 019	3/4" Tap K053 069	1-1/4" Tap K053 110	
	1/2" Tap K053 157	1" Tap K053 221	1-1/2" Tap K053 146	
1A	3/8" Tap K053 018	3/4" Tap K053 070	1-1/4" Tap K053 144	Body (N.C.)
	1/2" Tap K053 064	1" Tap K053 219	1-1/2" Tap K053 145	
2	K212 001	K212 002	K313 029	Upper Piston Assy
*3	H136 48	H137 28	H137 52	Seal

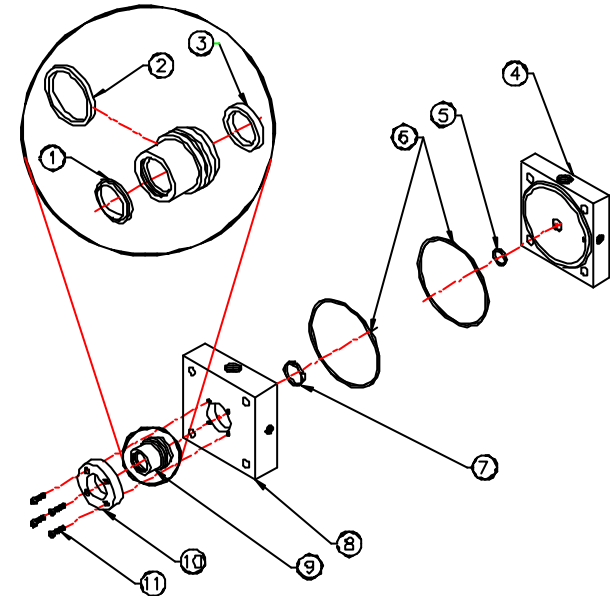
* Parts included in seal kit

6.9 PNEUMATIC CYLINDER A SERIES (NUMATICS)

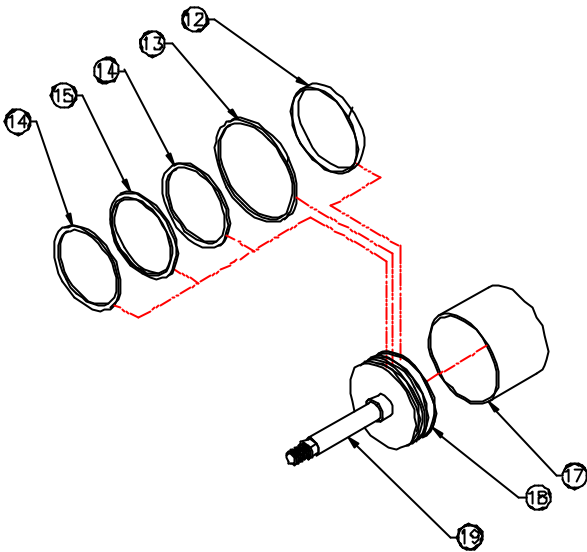
Location	Item	ECL Code	Reference	Repair Kit
Prehension bell on tapping	C.5.	1-10-191-78	NFPA P3 101.6/34.9 S55.6	1-10-781-79
Clamp actuator lowering	K.6.	1-10-170-94	NFPA X2 101.6/34.9 S1700	1-10-240-85
Safety holding extracting	L12.	1-10-684-95	NFPA P1 38.1/15.2 S 50.8	1-10-780-94



Pneumatic Service Temperatures:
Nitrile Seals: -10°F (-23°C) to 165°F (74°C)
Viton® Seals: 0°F (-17°C) to 400°F (204°C)



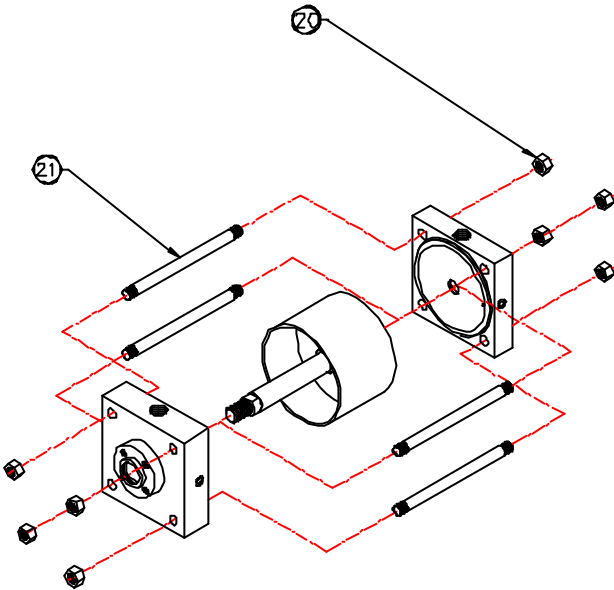
Head, Cap, and Bushing Assembly



Piston/Rod Assembly

Repair Kit Parts	
Part #	Description
5	Cap Cushion Seal
6	Tube End Seal
7	Head Cushion Seal
9	Loaded Bushing
12	Wearband
14 [#]	Piston Seal Back-Up Ring
15 [#]	T-Seal Piston Seal
10 cc. Tube Numatics' Lube	

Notes:
Cushion seals not included in kit unless specified in seal and repair kit part number.
[#] T-Seal is the standard piston. If low breakaway seal or repair kit is ordered, piston seals will change from T-Seal to U-Cup piston seals.

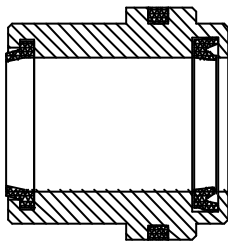


Cylinder Assembly and Tie Rod Torque

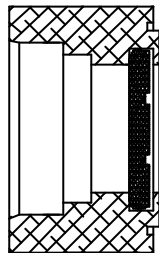
Repair Kit Installation Instructions

1. Loosen 4 Retainer Screws (Part #11) to remove Loaded Bushing (Part # 9).
2. Loosen 4 Tie Rod Nuts (Part #20) to remove Piston/Rod Assembly (Part #18 & #19).
3. Carefully remove seals. (Part #5*, #6, #7*, #12, #14, & #15*) *Any damage to the seal grooves may result in leakage.*
4. Lubricate all seals with supplied Numatics' Lube. *Examine seals before installing for any contamination. Contamination may cause leakage.*
5. Install Piston Seal (Part #15). Make sure the piston seal is not twisted inside groove. Next install back-up rings (Part #14) if piston seal is a T-seal.
6. Install lubricated Wearband (Part #12) onto piston. Sink piston/rod assembly into sinker tube.
7. Apply lube inside the cylinder tube (Part #17).
8. Sink piston/rod assembly into cylinder tube.
9. Press piston/rod assembly flush with the cylinder tube. Wipe off any lube from the face of the piston.
10. Place Tube End Seals (Part #6) into head and cap seal grooves. *Examine seals after installing for any contamination. Contamination may cause leakage.*
11. Lightly grease Rod Seal (Part #3) and Bushing O-ring (Part #2) of Loaded Bushing before installing. This will ease the installation of the rod bushing over the rod and into the bushing pocket in the head.
12. Reassemble cylinder except for Loaded Bushing (Part #9). First, loosely torque Tie Rod Nuts (Part #20) to allow head and cap to rotate slightly. Carefully place bushing over the rod until getting interference. With a twisting motion, slide the bushing down onto the rod and into the bushing pocket in the head.
13. Place Bushing Retainer (Part #10) over bushing and lightly tighten Retainer Screws (Part #11).
14. Before final torque, place cylinder on level surface. This will ensure that the cylinder head and cap are square. Torque Tie Rod Nuts (Part #20) in a crisscross pattern. Use the following charts for torque tolerances for Tie Rod Nuts and Retainer Screws.
15. Stroke cylinder by hand. This will enable detection of any binding. If binding does occur, repeat steps 12-14.

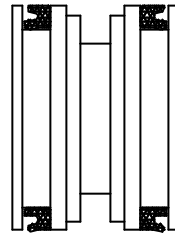
Seal Installation Guide



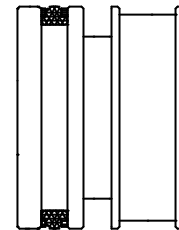
Loaded Bushing



Cushioned Head
or Cap



Low Breakaway
Piston



T-Seal Piston

Torque Tolerances (FT-LBS) Part #20		
Bore	Min.	Max.
1 ½	8	10
2	15	20
2 ½	15	20
3 ¼	23	30
4	23	30
5	50	60
6	50	60
8	80	90
10	200	220
12	200	220
14	300	330

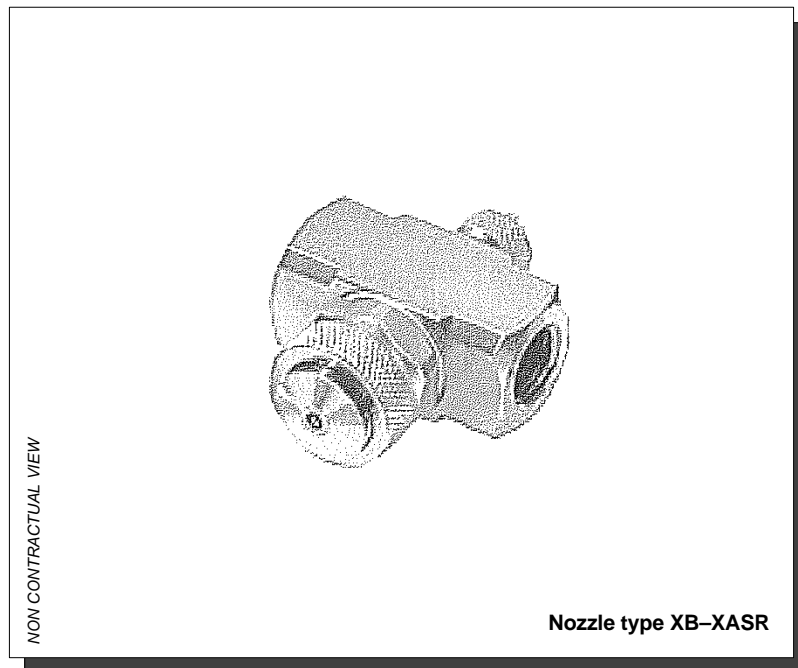
Retainer Screws Torque Tolerances Part# 11		
Size	Min.	Max.
#10-32	1	1.5
¼-28	5	7
5/16-24	10	12

Sinker Tubes are not included in kits. They can be ordered using the part numbers from the provided chart.

Sinker Tube Part Numbers	
Bore	Part #
1 ½	A06-K91
2	A06-L91
2 ½	A06-M91
3 ¼	A06-P91
4	A06-R91
5	A06-T91
6	A06-U91
8	A06-W91
10	A06-X91
12	A06-Y91
14	A06-B91

6.10 ATOMISATION – NOZZLE TYPE XB–XASR

Location	Item	ECL Code	Reference
Condensats pulverization	E.4	1–10–369–55	XB–XASR



SETTING FOR THE WATER CONDENSATE ATOMIZER OF THE PNEUMATIC EQUIPMENT

The maximum suction height is 200 mm with the model XB–XASR.

The working pressure, with this height for the cabin air conditioning unit is 1.5 bar.

With these conditions, the system is able to atomise 10.8 l/h of water with a calculated consumption of compressed air of 3.48 Nm³ /h or 60 l/min.

In case of water dripping from the overfill hose, increase the working pressure to 2 bars to increase the atomisation capacity (and then the air consumption).

Check the good operation of the atomiser, water fog from the nozzle and check for any leakage from the water suction pipe.

It is **NECESSARY** to not increase the height of the atomizer relative to the water tank to avoid a drop in the atomizer efficiency. As an example, a 300 mm increase of this height reduces the atomisation capacity to 2.8 l/h.

In that case, it is impossible to vaporise all the condensate produced by the air conditioning unit (6 to 10 l/h depending on atmospheric conditions)

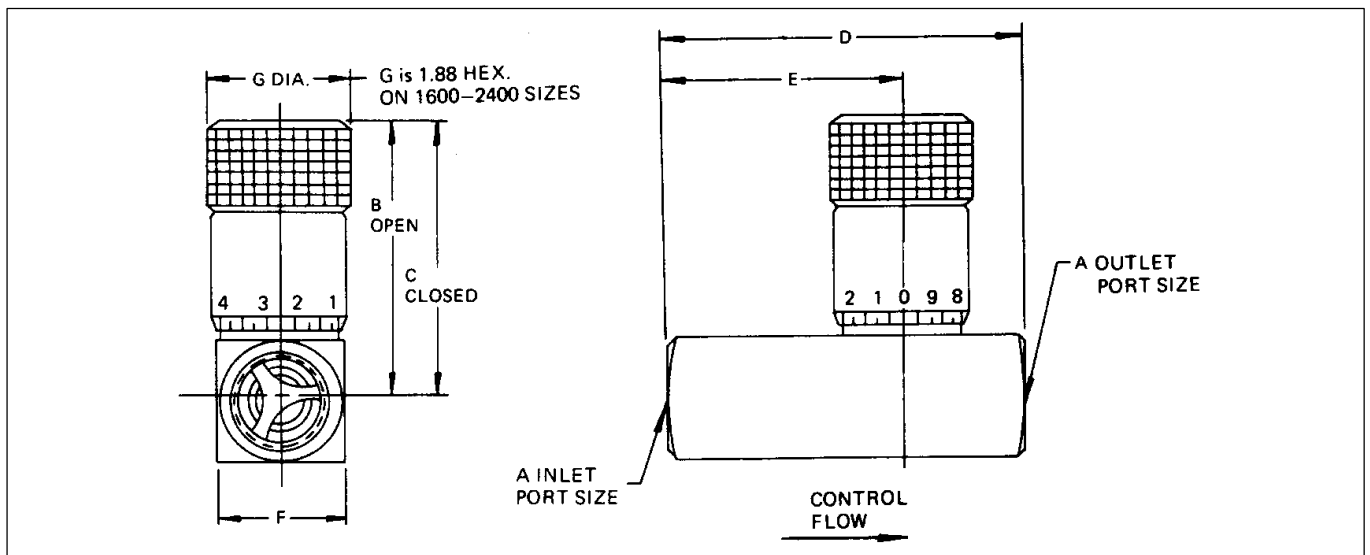
6.11 FLOW CONTROLLER F (PARKER)

1. DESCRIPTION

F Series valves provide controlled flow in one direction and free flow in the other (Integral reverse flow check is standard).

Maximum Pressure

- Steel 3000 PSI (210 Bar)
- Sizes 1/8", 1/4", 3/8", 1/2", 3/4", 1", 1 1/4", 1 1/2", 2"
- Flow Capacity 0–85 GPM (0–378 UMIN)
- Valves available inline or subplate mounted
- Filtration 25 Micron or Less

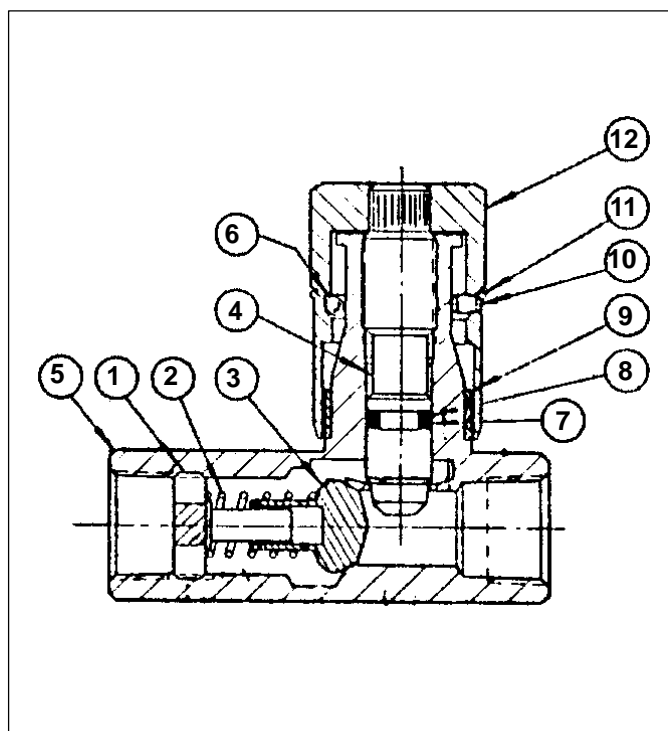


SIZE	A BSP	B	C	D	E	F	G
200	1/8	1.54 (39)	1.39 (35)	2.00 (51)	1.28 (33)	0.62 (16)	0.75 (19)
400	1/4	1.79 (45)	1.59 (40)	2.62 (67)	1.67 (42)	0.81 (21)	0.81 (21)
600	3/8	2.18 (55)	1.95 (50)	2.75 (70)	1.75 (44)	1.00 (25)	1.00 (25)
800	1/2	2.70 (69)	2.42 (61)	3.43 (87)	2.24 (57)	1.25 (32)	1.18 (30)
1200	3/4	3.38 (86)	2.81 (71)	3.87 (98)	2.53 (64)	1.50 (38)	1.37 (35)
1600	1	4.87 (124)	4.21 (107)	5.00 (127)	3.27 (83)	1.75 (44)	—
2000	1 1/4	5.12 (130)	4.46 (113)	5.62 (143)	3.87 (98)	2.25 (57)	—
2400	1 1/2	5.37 (136)	4.71 (120)	5.62 (143)	4.46 (113)	2.75 (70)	—

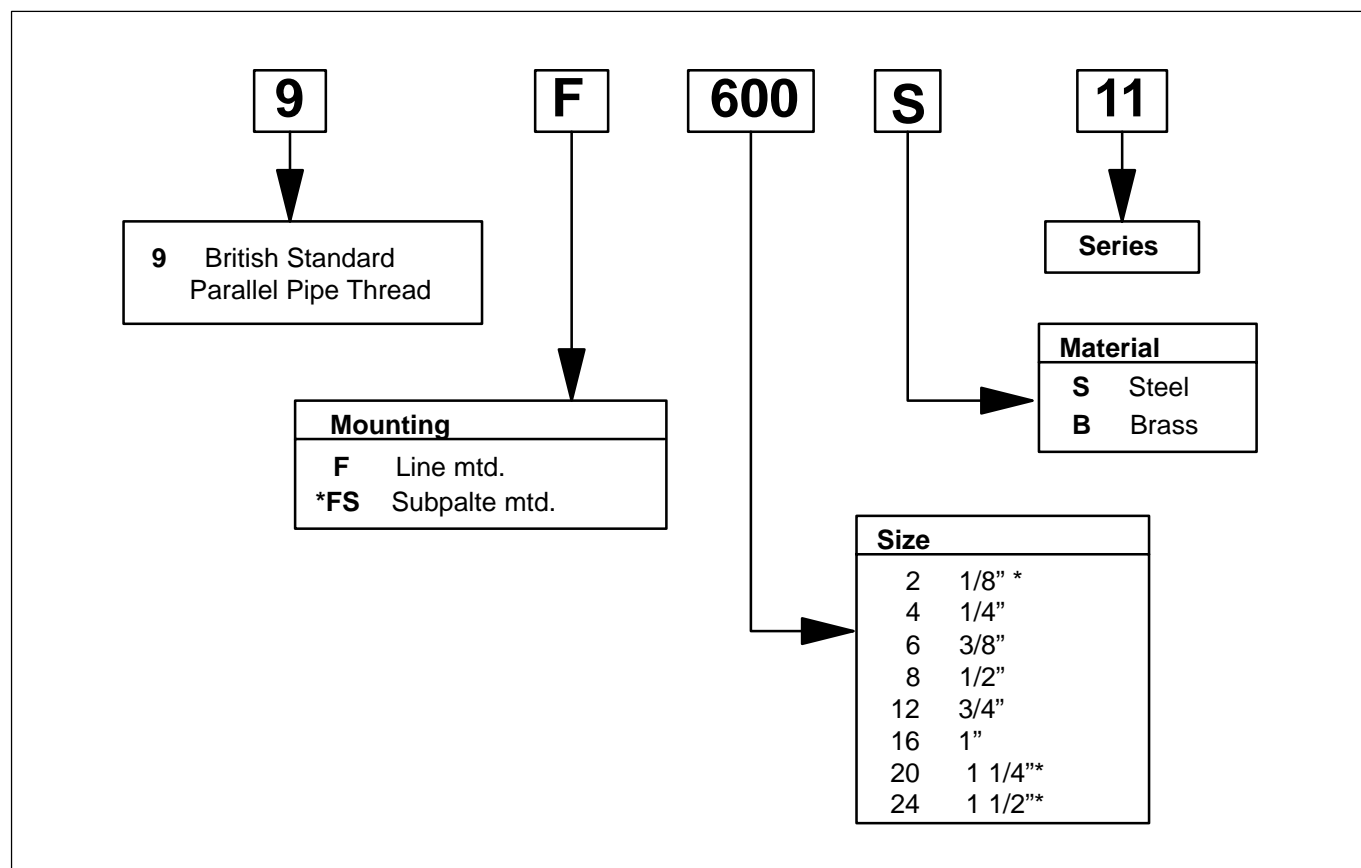
(Millimeter equivalents for inch dimensions are shown in (**))

2. BRASS VALVE – PARTS LIST

N°	DESCRIPTION	QTY
1	Retainer, Spring	1
2	Spring	1
3	Poppet	1
4	Needle	1
5	Body (Brass)	1
6	Ball, Locking	1
7	O-Ring	1
8	Back-up ring	1
9	Color-ring	
10	Screw, socket set	1
11	Retaining ring	1
12	Knob	1



3. VALVE MODEL NUMBER



6.12 CRUST-BREAKER LUBRICATOR L68M

1. FILLING & ADJUSTMENT PROCEDURE OF THE CENTRALIZED OILING FOR CRUST BREAKER (EXAMPLE)

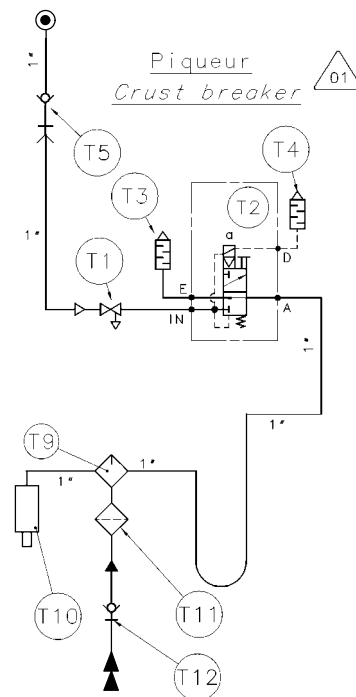
1.1. PRINCIPLE DIAGRAM

Figure 1 – Breaking mechanism oiling

Oil feeding ➡
 Oil circuit ➡
 Air feeding ●
 Air circuit ➤

T1 Cock with air draining
 T2 Valve
 T3 Air exhaust muffler
 T4 Pneumatic muffler
 T5 Push pull air pressure

 T9 Lubricator
 T10 Crust breaker
 T11 Filter
 T12 Oil filling plug

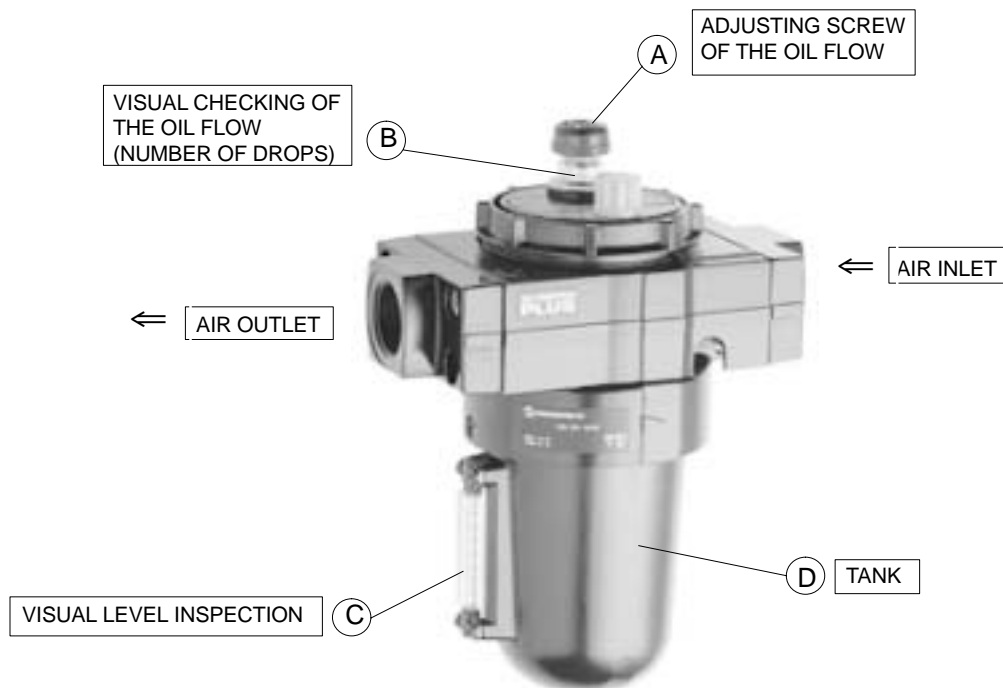


1.2. OIL FILLING PROCEDURE

- Check the oil level (C) every month and re-adjust the level at each maintenance cycle
- Turn off the cock (T1)
- The lubricator is equipped with a Quick fill device, use this device to fill the tank of the lubricator
 - In case of lower temperature, fill the tank with a mix (Alcohol isopropylic (Isopropanol) and oil)
 - 9 volumes of Isopropanol / 1 volume of SHELL TELLUS T32 oil
- Disconnect the oil filling unit
- Open the cock (T1)
- After the oil filling, check the good lubrication of pneumatic components and the good working of oilers

1.3. ADJUSTMENT OF OILERS

Figure 2 – Description



- Adjustment: the “DIAL Set” knob (**A**) is factory set so that when turn to zero (0) no oil is delivered to the venturi for atomization and equipment is not being lubricated. To adjust oil drip rate, turn on the air, start flow and set knob (**A**) to obtain the desired drip rate – visible through the sight glass (**B**). As a start, one to two drops per minute is suggested – correct lubrication being a matter of experience and demand. Clockwise rotation of knob decreases oil feed rate. To check lubrication hold thumbnail or a mirror near the equipment exhaust. A heavy film indicates over-lubrication and the drip rate should be reduced, by turning knob to a lower setting.

– Example of the oil flow adjustment :

- OILER OF CRUSTBREAKER (**T10**) : 11 drops/minute

Note : This is constant density type oiler which delivers a constant ratio of oil to air flow. Therefore, if air flow increases or decreases, oil delivery will be adjusted proportionally.

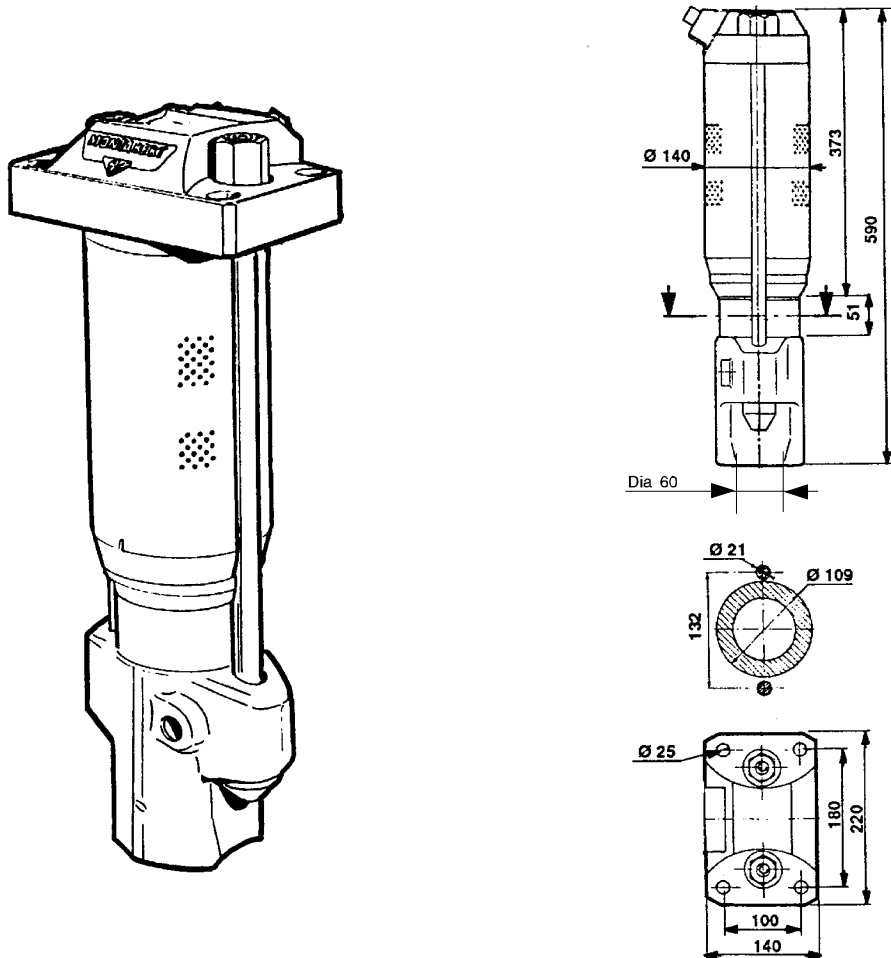
– Trouble

In case of trouble, check the filter (**T11**)

6.13 INSONORIZED CRUST BREAKER Z92 (MONTABERT)

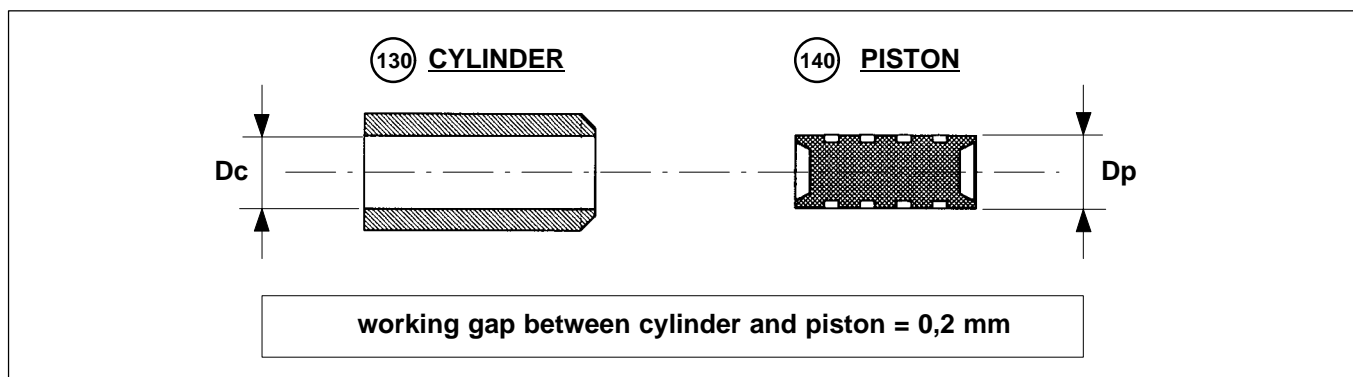
1. DESCRIPTION AND TECHNICAL DATA

Insonorized crust breaker	Z92 MONTABERT
Equipped with non magnetic valve	58543
Weight	40 Kg
Air consumption at 5,5 bars of pressure	2300 l / mn
Operating pressure	5,5 bars
Bore of cylinder	90 mm
Piston stroke	115 mm
Weight of the piston	5 Kg
Theoretical striking period	1200 shocks per minute
Noise level measured from 1 m with air pressure = 6 bars and shock without load (performed measure in work shop)	85 dB



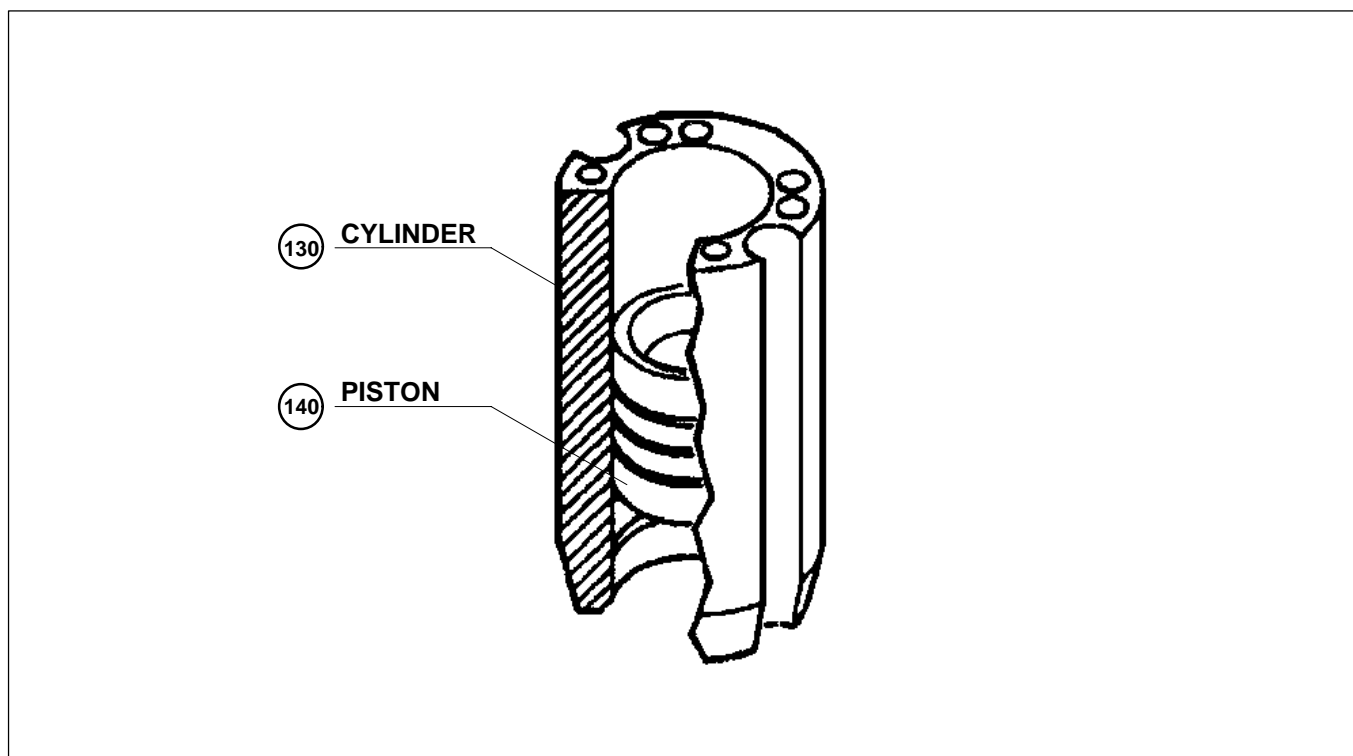
2. REPAIR KITS

At the first and second maintenance period, it is possible to repair the crust breaker by cylinder (**130**) machining or replacement and by piston (**140**) replacement.



The following parts of the crust breaker can be changed when they reach dimensions described hereafter.

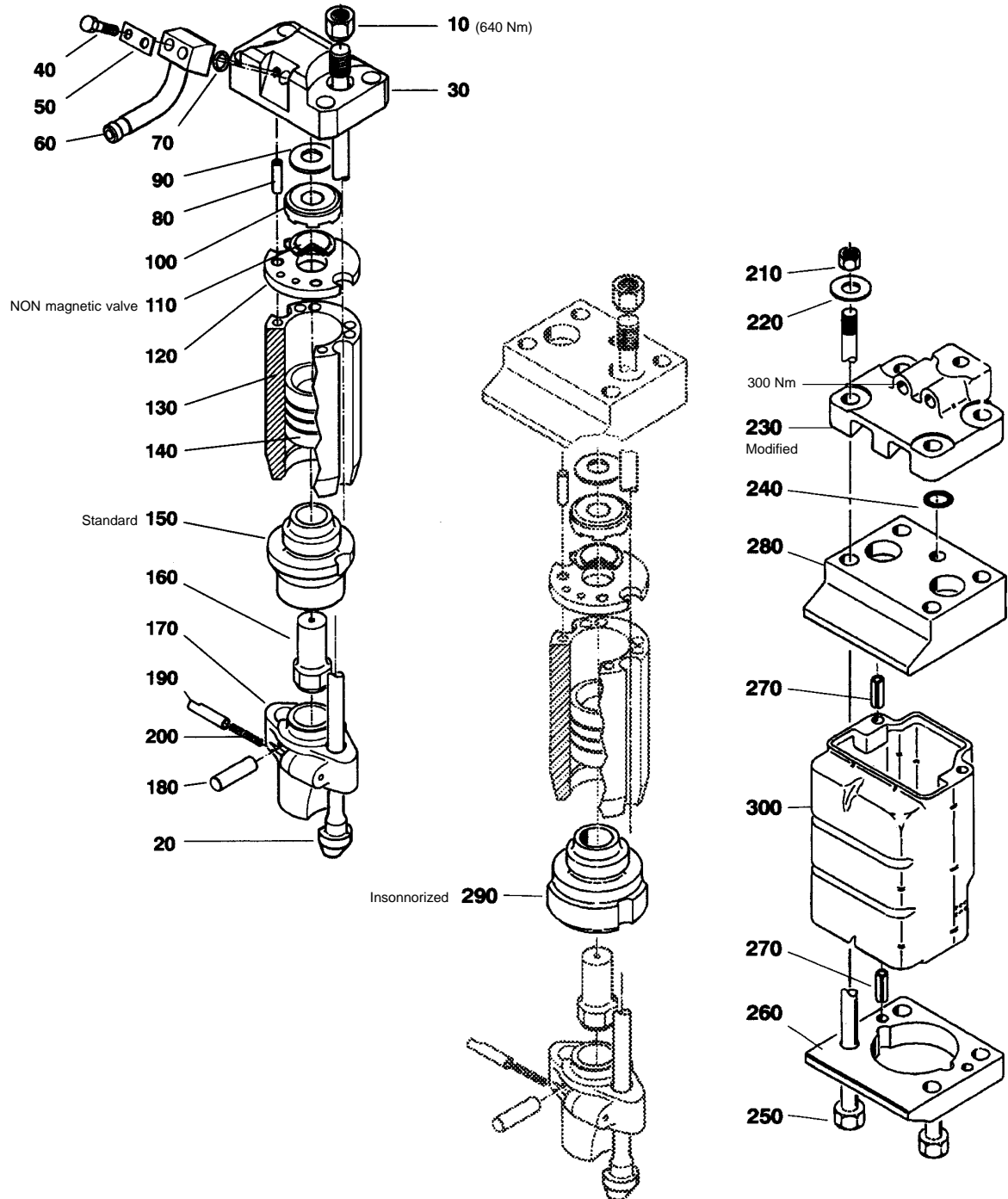
	CYLINDER (130)	PISTON (140)
Kit for maintenance $D_c = 90 / D_p = 89.94$	0-04-348-06	0-04-348-24



3. SPARE PARTS FOR INSONORIZED CRUST BREAKER Z92

When ordering of a complete crust breaker Z92 it is very important to indicate that the crust breaker is equipped with a non magnetic valve **(110)** and with modified spacer head **(230)**, ECL code : 0-00-464-75

For the two years spare parts recommendations see last page.



ITEM	DESCRIPTION	QTY	DWG CODE	DWG REV	CLIENT NOTES
------	-------------	-----	----------	---------	--------------

**1. INSONORIZED CRUST BREAKER Z92
WITH NON MAGNETIC VALVE**

0-00-348-05

10	Special nut	2	0-04-348-08	*	
20	Special screw	2	0-04-348-02	*	
30	Back head	1	0-04-348-49		
80	Pin	2	0-04-348-13		
90	Spring washer	1	0-04-348-27		
100	Distribution box	1	0-04-348-01		
120	Seat valve	1	0-04-348-29		
130	Cylinder	1	0-04-348-06	(1)	
140	Piston of repair 1st cote		0-04-348-23	*	
140	Piston	1	0-04-348-24	*	
160	Buffer block	1	0-04-348-16	*	
170	Front guide	1	0-04-348-14		
180	Retainer	1	0-04-348-00	*	
190	Stop pin	1	0-04-348-07	*	
200	Spring	1	0-04-348-26	*	
210	M 24, hex. nut	2	0-04-348-52		
220	Washer	2	0-04-348-51		
230	Spacer head	1	0-04-348-53		
240	O'ring	1	0-04-348-44		
250	M 24, hex. head screw	2	0-04-348-42		
260	Cover	1	0-04-348-50		
270	Elastic pin	4	0-04-348-47		
290	Spacer (InsonnORIZED)	1	0-04-348-45	*	
300	Soundproofing hood	1	0-04-348-48		

OPTION

110	Non magnetic valve	1	0-04-348-34	*	
-----	--------------------	---	-------------	---	--

*** : 2 years spare parts recommendations**

(1) : Interior quotation 90.09 to machined at 90.5

6.14 PNEUMATIC CYLINDER VDMA SERIES

Location	Item	ECL Code	Reference	Stroke	Diameter
Bath feeding locking	G.5	1-10-216-10	VDMA 24562_DIN / ISO 6431	80	50
Clamp extracting	L.7	1-10-172-97		60	63



NON CONTRACTUAL VIEW

SERIES ISO / VDMA



ASSEMBLY MANUAL

VDMA CYLINDERS



ASSEMBLY MANUAL FOR VDMA CYLINDERS

Part-no.: D-DKM-GB-1-AMCC
Rev.: 1.0

CONTENTS

1. EQUIPMENT, YOU NEED FOR MOUNTING VDMA-CYLINDERS
2. SELECTION CHART FOR VDMA-CYLINDER
3. COMPONENTS, YOU NEED FOR VDMA-CYLINDERS
4. MACHINING
5. PISTON ROD ASSEMBLY
6. END CAP ASSEMBLY
7. ASSEMBLY HEAT RESISTANT CYLINDER (function A + B)
8. FUNCTION AND LEAKAGE TEST
9. PREPARATION FOR SHIPPING
10. MAINTENANCE

Subject to modification
March 11. 2002



ASSEMBLY MANUAL FOR VDMA CYLINDERS



ASSEMBLY MANUAL FOR VDMA CYLINDERS

1. EQUIPMENT, YOU NEED FOR MOUNTING VDMA CYLINDERS

- LATHE, TO MACHINE THE PISTON ROD
- SAW, TO CUT THE EXTRUSION BARREL
- CONICAL BARREL – TOOL (SEE CHAPTER 5.2)
- SPECIAL TOOLS, TO SCREW ADAPTERS INTO THE BARREL
- DEVICE, FOR RIGHTANGLE TAPPING OF ADAPTERS
- GREASE KLUEBER POLYLUB GA 352
- SCREW LOCK LOCTITE 243
- TESTING EQUIPMENT
- LEAK DETECTION FLUID

SELECTION CHART FOR VDMA-CYLINDERS

1 ST digit	2 ND digit	3 RD - 5 TH digit	6 TH d	7 TH - 10 TH digit	11 th - 13 th digit	14 th - 15 th digit
SERIES	TYPE	PISTON Ø	STROKE		Cylinder mounting	special option
W = cylinder profile version	double acting					
	A = high-temperature range of +180 °C single rod without magnet	32		0025-1500	C01 = foot bracket CF2 = flange on front side CF2 = flange on rear side C03 = foot bracket plain	00 = standard version
only sensors and switches from series SPR-SNR-SRR-	B = high-temperature range of +180 °C through rod without magnet	40		0025-1500		
		50		0030-2000		
	E = single rod without magnet	63		0030-2000	CF4 = rod clevis front side C04 = rod clevis both sides	E1 = without cushioning
		80		0040-2200	CF5 = oscillating clevis front	
	F = through rod without magnet	100		0040-2200	CF5 = oscillating clevis front CF6 = alignment coupler front C07 = oscillating brackets lugs C08 = oscillating brackets fork	
	G = single rod with magnet				C13 = oscillating joint bracket sperical C14 = oscillating bracket fork type, narrow clevis	
	H = through rod , with magnet				B00 = cylinder with extended piston rod for mounting of locking unit	

3.) THE COMPONENTS YOU NEED FOR VDMA-CYLINDER

3.1) W-STYLE SINGLE ROD



1 st digit	2 nd digit		
	Funktion		
W	A	single rod end	heat resistant to 180 °C
	E	single rod end	without magnet
	G	single rod end	with magnet

Ø	FRONT CAP KIT		REAR CAP KIT		PROFILE	
	qty	part no.	qty	part no.	qty	part no.
32	1	252-145	1	252-146	1	W06-0132
40	1	252-147	1	252-148	1	W06-0140
50	1	252-149	1	252-150	1	W06-0150
63	1	252-151	1	252-152	1	W06-0163
80	1	252-153	1	252-154	1	W06-0180
100	1	252-155	1	252-156	1	W06-01100

Subject to modification
March 11, 2002

5/21

3.1 W-STYLE SINGLE ROD

Ø	ADAPTER		SCREW BOLT		WASHER	
	qty	part no.	qty	part no.	qty	part no.
32	8	125-950	8	127-637	8	128-206
40	8	125-950	8	127-637	8	128-206
50	8	125-866	8	127-638	8	128-207
63	8	125-866	8	127-638	8	128-207
80	8	125-867	8	127-639	8	128-208
100	8	125-867	8	127-639	8	128-208

Ø	PISTON ROD		CUSHIONING CONE		PISTON NUT	
	qty	part no.	qty	part no.	qty	part no.
32	1	154-151	2	116-360	1	128-252
40	1	154-152	2	116-362	1	128-254
50	1	154-153	2	116-364	1	128-254
63	1	154-154	2	116-366	1	128-255
80	1	154-155	2	116-366	1	128-255
100	1	154-156	2	116-367	1	128-256

Ø	MAGNETIC PISTON		NON MAGNETIC PISTON		BLANK NAME PLATE	
	qty	part no.	qty	part no.	qty	part no.
32	1	253-122	1	253-129	1	122-792
40	1	253-123	1	253-130	1	122-792
50	1	253-124	1	253-131	1	122-792
63	1	253-125	1	253-132	1	122-792
80	1	253-126	1	253-133	1	122-792
100	1	253-127	1	253-134	1	122-792

Subject to modification
March 11, 2002

6/21



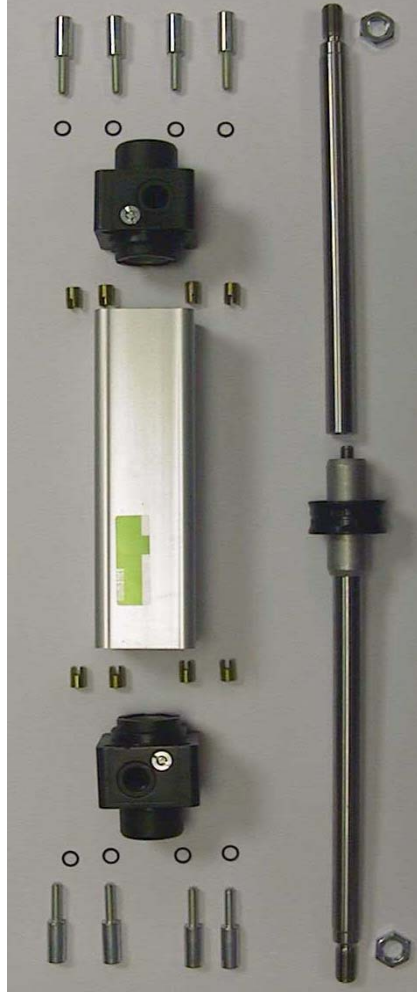
ASSEMBLY MANUAL FOR VDMA CYLINDERS



ASSEMBLY MANUAL FOR VDMA CYLINDERS

Contents			
Front cap	aluminium cap	magnetic piston	2x piston halves
	NBR O-ring		wear band
	PU rod seal		magnetring
	PU cushion seal	non magnetic piston	1 x piston compl.
Rear cap	DU bushing		2x spacer
	aluminium cap		
	NBR O-ring		
	PU cushion seal		

3.2) W-STYLE DOUBLE ROD



1 st digit	2 nd digit	
	Funktion	
W	B	double rod end
	F	double rod end
	H	double rod end
		heat resistant to 180 °C
		without magnet
		with magnet

3.2 W-STYLE DOUBLE ROD

Ø	ADAPTER		SCREW BOLT		WASHER	
	qty	part no.	qty	part no.	qty	part no.
32	8	125-950	8	127-637	8	128-206
40	8	125-950	8	127-637	8	128-206
50	8	125-866	8	127-638	8	128-207
63	8	125-866	8	127-638	8	128-207
80	8	125-867	8	127-639	8	128-208
100	8	125-867	8	127-639	8	128-208

Ø	PISTON ROD		ANTI PISTON ROD	
	qty	part no.	qty	part no.
32	1	154-159	1	154-160
40	1	154-161	1	154-162
50	1	154-163	1	154-164
63	1	154-165	1	154-166
80	1	154-167	1	154-168
100	1	154-169	1	154-170



ASSEMBLY MANUAL FOR VDM CYLINDERS



ASSEMBLY MANUAL FOR VDM CYLINDERS

Ø	MAGNETIC PISTON		NON MAGNETIC PISTON	
	qty	part no.	qty	part no.
32	1	253-122	1	253-129
40	1	253-123	1	253-130
50	1	253-124	1	253-131
63	1	253-125	1	253-132
80	1	253-126	1	253-133
100	1	253-127	1	253-134

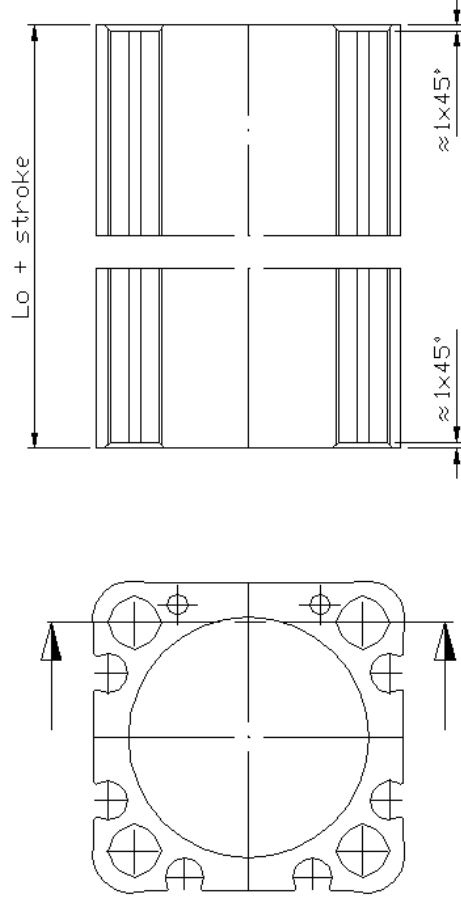
3.2 W-STYLE DOUBLE ROD

Ø	CUSHIONING CONE		BLANK NAME PLATE	
	qty	part no.	qty	part no.
32	2	116-360	1	122-792
40	2	116-362	1	122-792
50	2	116-364	1	122-792
63	2	116-366	1	122-792
80	2	116-366	1	122-792
100	2	116-367	1	122-792

Contents	
front cap	aluminium cap
	NBR O-ring
	PU rod seal
	PU cushion seal
	DU bushing
magnetic piston	
2x piston halves	
wear band	
magnet ring	
non magnetic piston	
1x piston compl.	
2x spacer	

4.) MACHINING

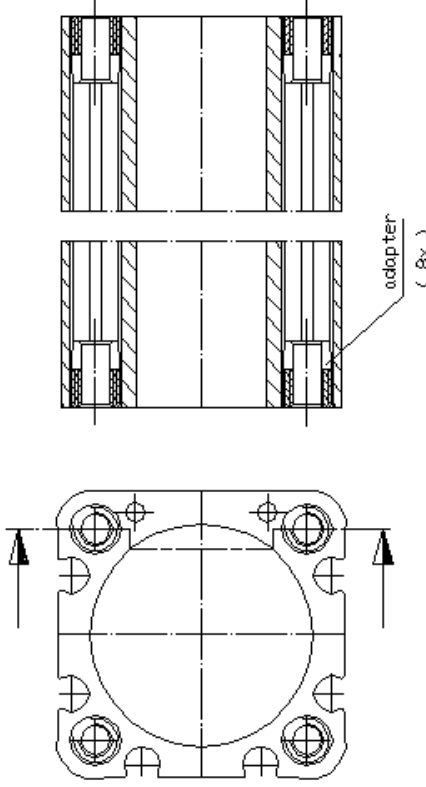
4.1.1) MACHINING THE PROFILE



Ø	Lo	max. tolerance
32	28,0	+0,5
40	38,0	+0,5
50	34,0	+0,5
63	45,0	+0,5
80	45,0	+0,5
100	55,0	+0,5

- Cut the length (L_o + stroke) with maximum allowed tolerance of ± 0.5 mm and orthogonal error of $\pm 2^\circ$
- deburr cylinder bore with blade
- chamfer bolt holes about $1\text{ mm} \times 45^\circ$
- clean from aluminium chips with air pistol

4.1.2 Adapter assembly



Assemble the adapters into each hole with help of tools



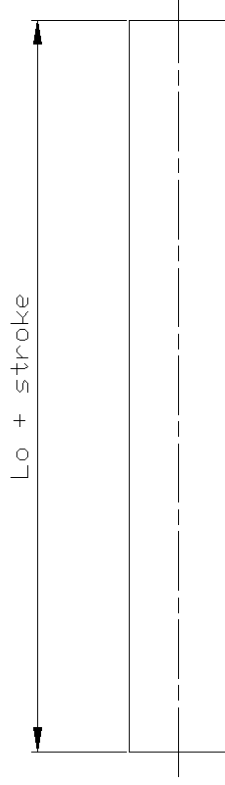
Use tool

Numatics part No 102.9955 (E6) for Adapter 125-900 (M6) for cyl Ø32 and Ø40
Numatics part No 102.9956 (E8) for Adapter 125-866 (M8) for cyl Ø50 and Ø63
Numatics part No 102.9957 (E10) for Adapter 125-867 (M10) for cyl Ø80 and Ø100
 Adapters are self tapping and slot must show into the barrel .

Put Locite No 243 on external adapter thread before tapping.

4.2.1.) MACHINING THE PISTON ROD

Cut the piston rod according to your needs, the length is given by the desired stroke + the length L_0 (see table) and work the raw piston rod according to the undermentioned table or software programm.



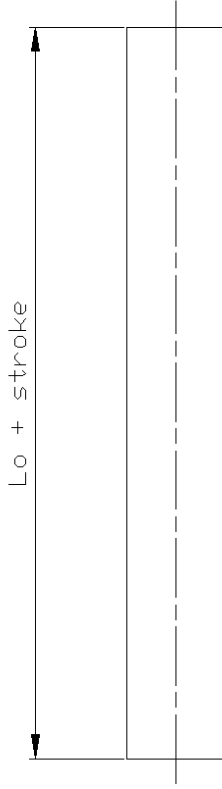
Ø	L ₀	max. tolerance
32	121	+1
40	135	+1
50	154	+1
63	170	+2
80	191	+2
100	195	+2

- Use only raw material with perfect cylindrical profile
- If rod material is stainless steel, the external surface should be rolled in order to improve the surface roughness.

4.2.2) MACHINE ON LATHE THE PISTON ROD ACCORDING SOFTWARE PROGRAM OR ACCORDING DRAWING OF GmbH

4.2.3.) MACHINING OF THE BOTH PISTON RODS FOR THROUGH ROD CYLINDERS

Cut the piston rod according to your needs, the length is given by the desired stroke + the length L_0 (see table), and machine the raw piston rod according to the drawing below.

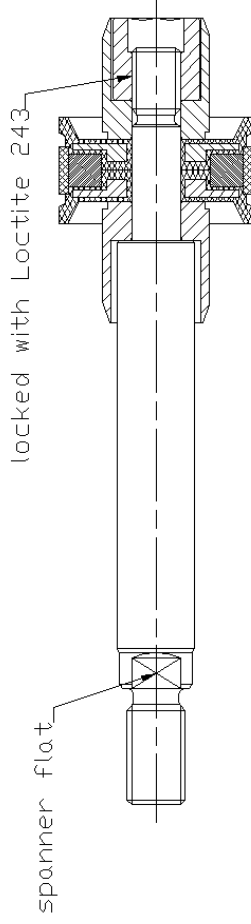


Ø	piston rod	companion rod	max. tolerance
	L_0	L_0	
32	134	84	+1
40	150	95	+1
50	169	107	+1
63	192	109	+2
80	212	130	+2
100	222	145	+2

- Use only raw material with perfect cylindrical profile
- If rod material is stainless steel, the external surface should be rolled in order to improve the surface roughness

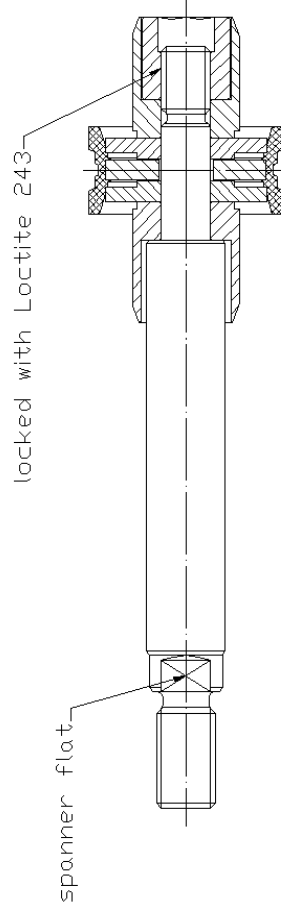
4.2.4.) MACHINE ON LATHE THE PISTON ROD ACCORDING SOFTWARE PROGRAM OR ACCORDING DRAWING OF GmbH

5.) PISTON ROD ASSEMBLY



magnet version

Couple cones, compl. piston on the nut according to the drawing onto the rod side without spanner flat.
(Magnetic pistons must have a magnet ring between the piston halves.)
Clean and dry that thread and apply Loctite no 243 before you screw the nut on the rod.
Make sure that all components are correctly assembled and lock the whole assembly with the appropriate allen key.



non magnet version



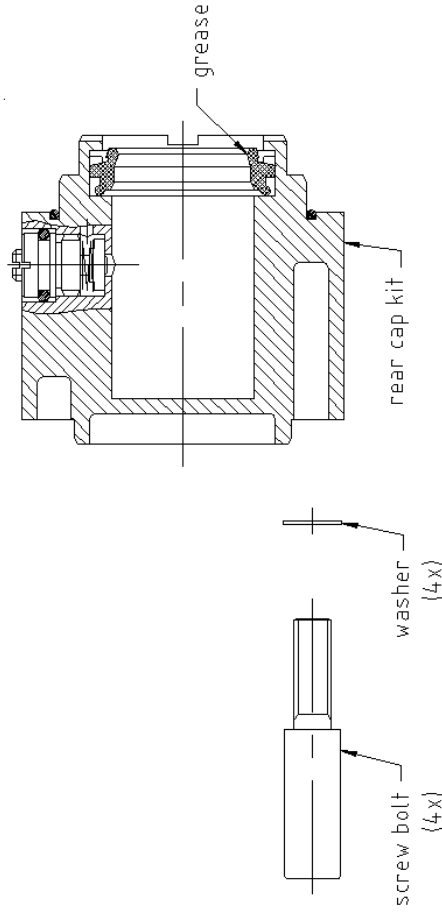
ASSEMBLY MANUAL FOR VDMA CYLINDERS



ASSEMBLY MANUAL FOR VDMA CYLINDERS

6.) END CAP and PISTON ASSEMBLY

6.1.) REAR END CAP ASSEMBLY



Add grease into the cushion seal if you assemble a cushioned cylinder, otherwise remove the cushion seal.

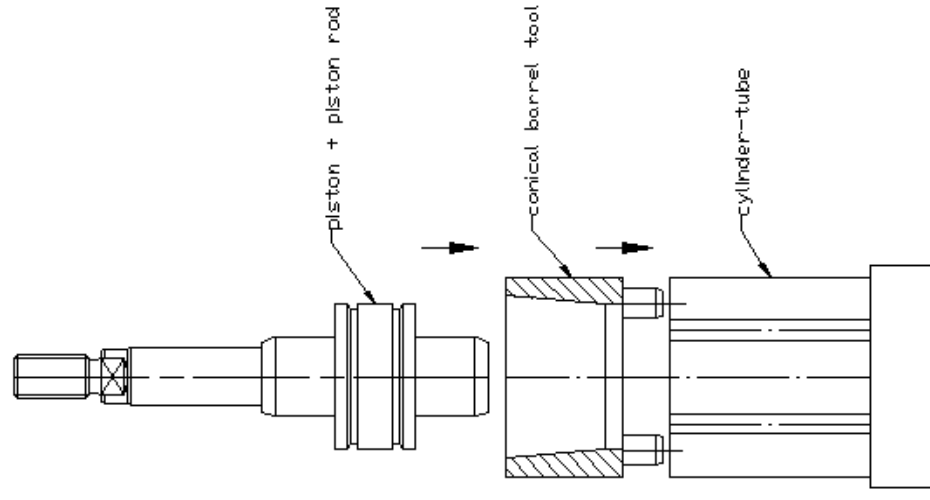
Place the rear end cap on the barrel and put screw bolts together with washers into the holes of the end cap.

Tighten the screw bolts across the diagonals to the torques according to the table.

Ø	torque [Nm]
32 + 40	12-16
50 + 63	22-26
80 + 100	27-32

6.2.) PISTON ASSEMBLY

Lubricate the cylinder bore of profile with grease Klueber Polyub GA 352 and use the conical piece of profile to insert the piston rod assembly inside the profile.





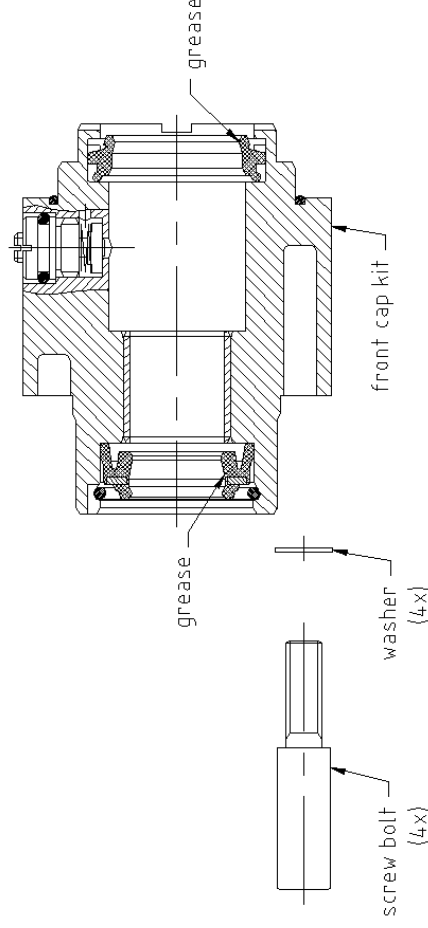
ASSEMBLY MANUAL FOR VDMA CYLINDERS



ASSEMBLY MANUAL FOR VDMA CYLINDERS

6.3.) FRONT CAP ASSEMBLY

Also grease cushioning seal if you assemble a cushioned cylinder, otherwise remove the cushion seal.
place the front end cap on the barrel and put screw bolts together with washers into the holes of end cap.
Tighten the screw bolts across the diagonals to the torques according the table of chapter 5.1.



After fixing the end caps move the piston manually to both end positions to check for smooth operation.

7.) ASSEMBLY HEAT RESISTANT +180°

interchange NBR and polyurethan seals into Viton seals according following table

Ø	part No of NBR + polymethan seals					part No of Viton seals				
	piston	rod seal	cushioning	o-ring		piston	rod seal	cushioning	o-ring	
32	253-129	124-207	124-208	126-293		253-136	124-278	124-273	126-300	
40	253-130	124-209	124-210	126-294		253-137	124-279	124-274	126-301	
50	253-131	124-267	124-268	126-295		253-138	124-280	124-275	126-349	
63	253-132	124-267	124-269	126-296		253-139	124-280	124-276	126-350	
80	253-133	124-270	124-269	126-297		253-140	124-281	124-276	126-351	
100	253-134	124-270	124-271	126-298		253-141	124-281	124-277	126-352	



ASSEMBLY MANUAL FOR VDMA CYLINDERS



ASSEMBLY MANUAL FOR VDMA CYLINDERS

8.) FUNCTION AND LEAKAGE TEST

8.1.) FUNCTION TEST.

Test proper function at minimum operating pressure of 0.8 bar

8.2.) LEAKAGE TEST

- Leakage test must be performed at 1.5 and 6.3 bar.
- Pressurize front chamber and use leakage test fluid for testing leakage around piston seal and front cap.
- Pressurize rear chamber and test leakage around the rear cap.
- Test leakage across piston
- Connect non pressurized chamber with hose and place the other hose in a glass filled with water
- Check for complete of bubbles in glass while pressure is given to the other chamber.
- Measure stroke for one sample of each productions lot.
- Tolerance for stroke $\leq 100\text{mm}$: $\pm 1.5\text{mm}$
- Tolerance for stroke $> 100\text{mm}$: $\pm 2.0\text{mm}$

Check for magnet ring detection

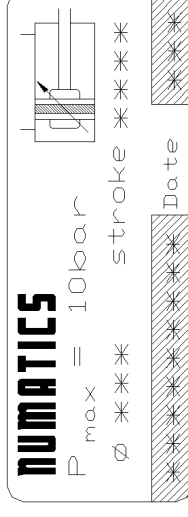
If cylinder has function G or H plug in the magnetic sensitiv switch (SRR or SPR) and check with LED if there is a magnet present.

Subject to modification
March 11. 2002

19/21

9.) PREPARATION FOR SHIPPING

- Dry and clean cylinder, eliminate remaining grease.
- Print label as shown below, including the country of origin.
- The label must show the **NUMATICS** logo with specified diameter stroke , cyl.-part No and date
- With cylinder ports towards operator and piston rod on left side, attach rectangular name plate on cylinder center line, starting from head cap.



- Protect ports with plastic plugs.

diameter	part-no.
32	74.0588
40	74.0589
50	74.0589
63	74.0590
80	74.0590
100	74.0591

Subject to modification
March 11. 2002

20/21



ASSEMBLY MANUAL FOR VDM A CYLINDERS

10.) MAINTENANCE

Repair Kits contents

- 2x O-ring
- 1x piston rod seal (or 2x in case of double rod cylinder)
- 1x piston
- 2x cushioning seal

repair kits

Ø	Cyl.-function	part no.	Cyl.-function	part no.	Cyl.-function	part no.
32	A	VA032/RK	B	VB032/RK	E	VE032/RK
40	A	VA040/RK	B	VB040/RK	E	VE040/RK
50	A	VA050/RK	B	VB050/RK	E	VE050/RK
63	A	VA063/RK	B	VB063/RK	E	VE063/RK
80	A	VA080/RK	B	VB080/RK	E	VE080/RK
100	A	VA100/RK	B	VB100/RK	E	VE100/RK

Ø	Cyl.-function	part no.	Cyl.-function	part no.	Cyl.-function	part no.
32	F	VF032/RK	G	VG032/RK	H	VH032/RK
40	F	VF040/RK	G	VG040/RK	H	VH040/RK
50	F	VF050/RK	G	VG050/RK	H	VH050/RK
63	F	VF063/RK	G	VG063/RK	H	VH063/RK
80	F	VF080/RK	G	VG080/RK	H	VH080/RK
100	F	VF100/RK	G	VG100/RK	H	VH100/RK

In case of cylinder maintenance, interchange all parts of repair kit after cleaning of old grease.

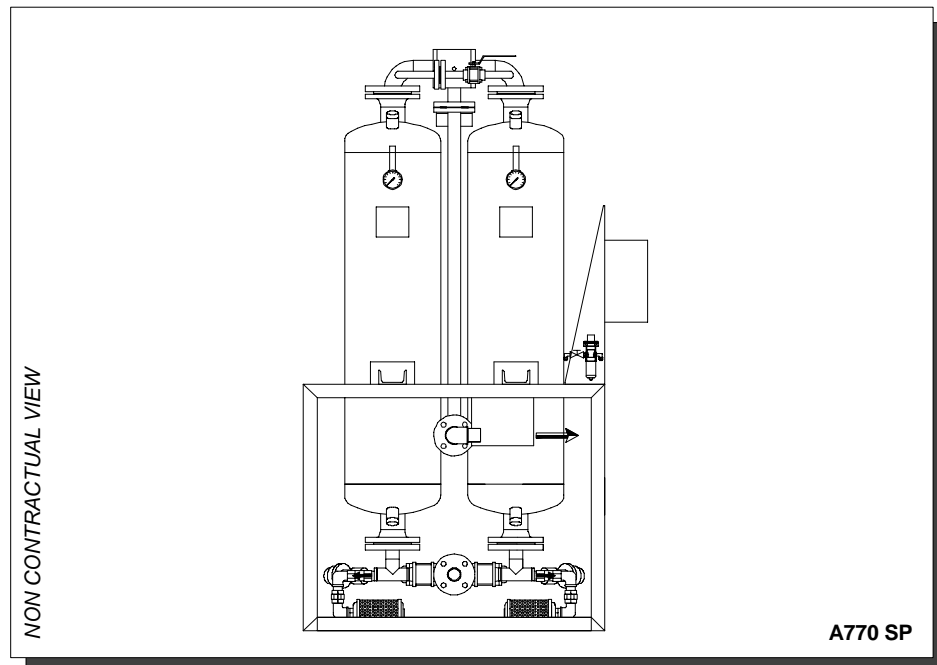
Work according chapter 4 ; 5 and 7.

Attention

Don't forget to lock the nut on piston rod with Loctite 243 and lubricate the cylinder tube and cushioning seal with Klueber Polyub GA 352.

6.15 MANUAL FOR THE AIR DRYING (CHAUMECA)

Function	ECL Code	Reference
Air drying by adsorption	1-10-896-01	A770 SP

**CAUTION**

The wear and tear inspection of the air drying have to be checked at each desiccant changing.

For the pressure testing and checking period of pressure vessels, refer to standards in force in the country.

MANUEL D'UTILISATION

USER MANUAL

→ SKID DE SECHAGE CLASSIC A770 SP

→ SKID FOR AIR DRYING CLASSIC A770 SP



Cette notice doit être lue soigneusement par toute personne responsable de la maintenance ou susceptible d'intervenir sur l'installation.

This leaflet has to be read by any person in charge of maintenance or installation of this material

SOMMAIRE

SUMMARY

- 1. LE SECHAGE ADSORPTION SANS CHALEUR**
HEATLESS DRYING
- 2. IMPLANTATION**
INSTALLATION
- 3. RACCORDEMENTS ELECTRIQUES & DESCRIPTIF DU COFFRET**
ELECTRICAL CONNECTIONS & CONTROL BOX DESCRIPTION
- 4. MISE EN SERVICE**
STARTING
- 5. UTILISATION DU SECHEUR**
UTILIZATION OF THE DRYER
- 6. CARACTERISTIQUES NOMINALES DU SECHEUR**
NOMINAL CHARACTERISTICS OF THE DRYER
- 7. DESCRIPTIF DU SECHEUR**
DESCRIPTION OF THE DRYER
- 8. REGENERATION DE L'ADSORBANT ADECAIR® I.I**
REGENERATION OF ADSORBANT ADECAIR® I.I
- 9. DEROULEMENT DU CYCLE DE FONCTIONNEMENT**
CYCLE PROGRESS
- 10. ENTRETIEN DU SKID**
SKID MAINTENANCE
- 11. ENTRETIEN DU FILTRE**
FILTER MAINTENANCE
- 12. CONDITIONS DE GARANTIE**
CONDITIONS FOR GUARANTEE
- 13. INCIDENTS DE FONCTIONNEMENT**
WORKING ANOMALIES
- 14. FICHE DE SECURITE PRODUIT DE L'ADSORBANT**
SECURITY SHEET FOR ADSORBENT ADECAIR® I.I

I. LE SECHAGE PAR ADSORPTION SANS CHALEUR HEATLESS DRYING

Le séchage s'effectue par adsorption sur un déshydratant solide hydrophile. Quand le déshydratant a adsorbé une certaine quantité d'eau, variable en fonction des conditions d'utilisation, il doit être régénéré. Afin d'obtenir un fonctionnement continu, les sècheurs SANS CHALEUR sont du type DUPLEX : une cuve est en service (à la pression du réseau) tandis que l'autre est en régénération (à une pression effective quasi nulle).

Dans un sécheur SANS CHALEUR, comme son nom l'indique, il n'est apporté aucune calorie de l'extérieur. L'adsorption étant un phénomène exothermique, on utilise la chaleur dégagée (environ 720 kilocalories par kg d'eau). Une permutation fréquente des deux colonnes permet de disposer de celle-ci avant qu'elle ne soit dissipée.

Par ailleurs, il est nécessaire d'effectuer un balayage d'air sec détendu pour évacuer l'eau désorbée. Il faut noter que, afin de ne pas perturber la pression en aval du sécheur et de ne pas soumettre le déshydratant à un régime brutal, avant chaque inversion, il y a une phase de remise en pression lente. L'inversion a lieu ainsi en équipression. La distribution de l'air s'effectue à l'aide d'un distributeur 3 voies, de deux vannes d'utilisation et la mise à l'atmosphère de la colonne à régénérer par deux électrovannes de purge commandées au moyen d'un coffret électronique pré-régulé en usine.

The drying occurs through adsorption on hydrophilic solid desiccant. When the desiccant has adsorbed a certain amount of water (depending on use conditions), it must be regenerated. To maintain a continuous operation, the HEATLESS DRYERS operate on two vessels: one vessel is in service (under network pressure), the other is undergoing reactivation (at almost no pressure).

In a traditional installation, regeneration is carried out by heating the desiccant and sweeping with gas for cooling. In an HEATLESS DRYER, as its name indicates, no calorie is externally generated. Because adsorption is an exothermic process, released heat is used (about 720 kilocalories per kg of water). Frequent alternation (every minute) of the two columns allows one to be prepared for use before the other one has reached its capacity.

In addition, it is necessary to sweep the desiccant with dry expanded gas in order to blow out water that was not adsorbed. It should be mentioned that to avoid altering to downstream dryer pressure and submitting the desiccant to overuse, there is a low pressure sequence prior to each reversal. The reversal takes place with pressure equal in both vessels.

2. IMPLANTATION INSTALLATION

Pour assurer une implantation correcte du sécheur, il faut essentiellement :

a) PREVOIR :

- un **ballon tampon** à la sortie du sécheur si le débit instantané dépasse notablement à certains moments le débit nominal du sécheur (fonctionnement par rafales) ; ce ballon peut-être utilement remplacé par un déverseur qui maintiendra une pression constante dans le sécheur.
- un **déshuileur ou un dévésiculeur** (filtres de la gamme FD) avant le sécheur pour éliminer les entraînements éventuels d'eau ou d'huile vésiculaires qui pourraient endommager l'adsorbant ADECAIR® I.I qui équipe le sécheur.
- un **filtre final** (filtres de la gamme FD) pour éliminer les particules d'adsorbant dans le cas d'utilisation d'un gaz sans poussière.
- un **by-pass** qui permette d'assurer l'entretien et le dépannage du sécheur. Prendre la précaution d'installer un by-pass étanche pour éviter le mélange du gaz sec et du gaz brut.

b) VEILLER :

- à ce que le raccordement éventuel des électrovannes de purge ne présente pas de risque de contrepression ou d'accumulation d'eau.
- à ne jamais collecter entre elles des purges sous pression.

To ensure a correct installation of the dryer, it is necessary to:

a) FORESEE:

- One **balloon-plug** at the outlet dryer if the instantaneous flowrate exceeds nominal flowrate sometimes (bursts working); that one can be replaced by a post-dryer tank which will maintain uniform pressure in the dryer.
- One **deoiler** or one **demister** (filters from FD range) before the dryer to eliminate water and oil vesicles which could damage the adsorbent ADECAIR® I.I.
- One **final filter** (filters from FD range) to eliminate adsorbent particles in case of antidust gas production.

b) CONTROL:

- There is no risk of back-pressure or water accumulation in draining electro valve connection.
- Never collect drains between them under pressure.

3. RACCORDEMENTS ELECTRIQUES & FONCTIONNEMENT DU COFFRET *ELECTRICAL CONNECTIONS & CONTROL BOX RUNNING*

ATTENTION !!! Le coffret électronique de commande du sécheur est préréglé en usine.

Il est vivement recommandé, sous peine de ne pas pleinement bénéficier des conditions de garantie, de ne procéder à aucune modification sans l'autorisation du Service Après Vente.

CAUTION !!! The electronic control box of the dryer is preset in our factory. It is highly recommend not to modify this box without after sales service agreement if you do not want to loose guarantee.

Raccordements électriques

Le skid est livré avec un coffret de pilotage électronique. L'interface client est une prise HARTING. La partie Mâle est fournie est reste à câbler selon schéma électrique représenté ci-dessous.

Electrical connections

This skid is delivered with an electronic control box. The customer interface is an HARTING plug. The male part is also provided and need to be connected following electric scheme represented below.

4. MISE EN SERVICE STARTING

- a) Vérifier les raccordements électriques et pneumatiques du sécheur. L'entrée d'air se situe sur l'aéroréfrigérant, et la sortie d'air après le filtre de sortie. Le raccordement électrique se fait sur la prise HARTING pour la partie sécheur. L'aéroréfrigérant est à raccorder directement.
- b) Vérifier la conformité de la tension électrique d'alimentation (24 Volts continu).
- c) Admettre progressivement la pression ; attendre l'équipression des deux colonnes C1 & C2.
- d) Mettre le coffret de commande sous tension.

a) Check electrical and pneumatic connections of the dryer. Air inlet is located on the air cooler; outlet is located after the filter. Electrical connections are to be done on the HARTING plug for the dryer. The air cooler has to be directly connected.

b) Check conformity of voltage (24 VDC)

c) You can now put slowly the dryer under pressure; wait for equal pressure between both columns.

d) Put the electrical box under voltage by connecting the HARTING plug.

5 . UTILISATION DU SECHEUR UTILIZATION OF THE DRYER

Le sécheur **CLASSIC A770 SP** est prévu pour traiter un débit d'air donné à une pression et une température données ; en conséquence, bien que le système du sécheur sans chaleur permette quelques écarts, il faut veiller, lors de l'exploitation de ce matériel à :

- a) éviter une vitesse de passage trop importante du gaz à la mise en service et donc pressuriser les deux colonnes lentement.
- b) ne jamais interrompre le balayage de régénération sous peine de dégrader l'adsorbant ADECAIR® I.I et les performances du sécheur.
- c) respecter les différents paramètres prévus à l'origine (pression, débit et température).
- d) éviter tout entraînement liquide sur l'adsorbant ADECAIR® I.I en purgeant régulièrement le ou les filtres installés en amont du sécheur et en remplaçant régulièrement les cartouches de ces filtres.
- e) by-passer le sécheur en cas d'interruption de l'alimentation électrique ou de défaillance du coffret de commande.

*The dryer **CLASSIC A770 SP** is design to treat a flowrate according to accurate pressure and temperature. Consequently, while heatless dryer system allows some variation, it is necessary to control to :*

a) Avoid too important gas crossing velocity during starting and pressurize slowly both columns.

b) Never stop regeneration scavenging on pain to degrade desiccant ADECAIR® I.I and dryer performances.

c) Respect the origin parameters (pressure, flowrate, temperature).

d) Avoid any liquid entrainment on desiccant ADECAIR® I.I in draining regularly the filters and in replacing the set filtering cartridges up the dryer.

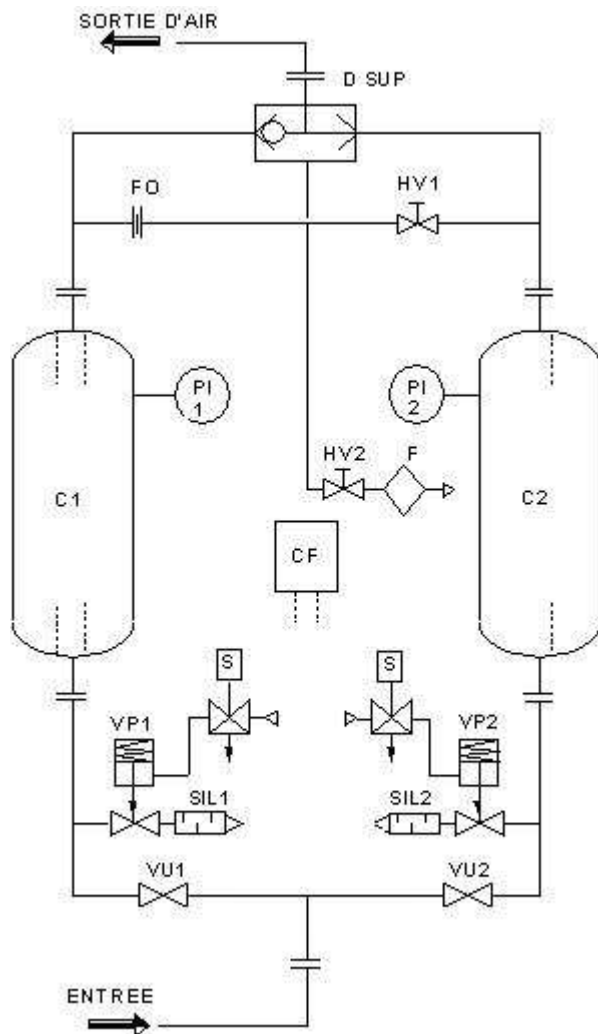
*e) By-pass the dryer **CLASSIC A770 SP** in case of switching off or control box failure.*

6. CARACTERISTIQUES DE VOTRE SECHEUR CHARACTERISTICS OF YOUR DRYER

	CARACTERISTIQUES POUR VOTRE APPLICATION / Characteristics for your installation	Unités/units
I - CONDITIONS D'UTILISATION / Using conditions : Nature du fluide à traiter : <i>fluid to treat</i> Nature de l'adsorbant : <i>adsorbant</i> Point de rosée sous pression garanti : <i>Dew point guaranteed</i> Température maxi du fluide à l'entrée : <i>Maximum inlet fluid temperature</i> Pression de service maximale : <i>Maximum working pressure</i> Débit à traiter : <i>Flow to treat</i>	AIR COMPRISE/ compressed air ADECAIR® I.I (CLASSIC A) 20°C de moins que l'ambiance/ <i>20°C less than atmosphere</i> 65 10 470	 °C °C Bar eff. m³/h *
II - CARACTERISTIQUES DE FONCTIONNEMENT / Cycle characteristics : Durée totale du demi-cycle / <i>full length of ½ cycle :</i> dont / including : Séchage / drying Régénération regeneration Repressurisation & attente / <i>pressurization and waiting</i>	 1 min 1 min 40 sec 20 sec	
III - CARACTERISTIQUES DE LA REGENERATION / Regeneration characteristics: Type de régénération / regeneration type :	PRELEVEMENT D'AIR SEC/ dry air deduction	
IV – UTILITES / utilities : Tension électrique d'alimentation / running voltage Protection interne / internal protection : Puissance électrique installée / electrical power installed :	 24 Fusible / fuse T6.3A 150	 VDC A Watts

* Ces débits s'entendent en m³/h mesurés aux conditions d'aspiration, c'est-à-dire 20°C pression atmosphérique. Flow in m³/h measured @ 20°C, atmospheric pressure.

7. DESCRIPTIF DU SKID DESCRIPTION OF THE SKID



Le sécheur **CLASSIC A770 SP** est constitué de :

a) deux colonnes de séchage (C1 & C2) ; colonnes en acier calculées pour une pression de service de **10.5 Bar**, et construites conformément à la législation en vigueur. Les fonds de ces colonnes sont équipés d'un orifice de remplissage et ou de vidange de l'adsorbant ADECAIR® I.I, les tubulures d'entrée et de sortie sont équipées de crépines amovibles qui interdisent toute évacuation de l'adsorbant ADECAIR® I.I contenu dans les colonnes et permettent une diffusion optimale de l'air à sécher dans la section de la colonne.

b) Un distributeur trois voies (D sup) : le distributeur supérieur est équipé d'une bretelle de balayage avec un diaphragme qui permet la récupération du gaz sec destiné à la régénération de l'adsorbant ADECAIR® I.I et à la repressurisation. Une bretelle de repressurisation complémentaire équipée d'un distributeur pneumatique permet d'augmenter le débit pendant cette phase d'une durée de 20 secondes.

Nota 1 : une vanne d'isolement (HV1) équipe également cette bretelle et doit normalement être ouverte en phase de marche.

Nota 2 : les premiers skids sont livrés avec un ensemble de diaphragme (FO) à adapter à la pression de service. Une fois cette pression déterminée, les skids suivant seront livrés avec un seul diaphragme adapté.

c) Deux vannes d'utilisation (VU1 & VU2) montées sur le distributeur inférieur permettant l'alimentation en air comprimé des colonnes.

Elles sont à double effet et pilotées par une fonction logique en fonction de la position des vannes de dépressurisation.

d) deux manomètres (PI1 & PI2) : montés sur chaque colonne.

e) Deux vannes de purge (VP1 & VP2) montées sur le distributeur inférieur permettant la dépressurisation et donc la permutation des cuves.

Elles sont "normalement fermées" c'est-à-dire fermées par manque d'air pilote, et elles sont pilotées par des électrovannes S.

f) Une ligne d'alimentation en air pilote avec une vanne d'arrêt (HV2) et un filtre (F) pour le pilotage des vannes.

g) Deux soupapes anti expansion thermique, montées sur chaque colonne.

h) Deux silencieux d'échappement (SIL1 & SIL2).

i) Un coffret de commande électronique (CF). Voir descriptif pages suivantes.

j) Un châssis cadre.

En outre, le skid complet est équipé de :

k) un aéroréfrigérant GEA ERGE SPIRALE, voir notice dans ce dossier.

l) un séparateur 3 étages en acier inoxydable.

m) un pressostat HERION.

n) un manomètre sur la ligne principale.

o) un thermomètre sur la ligne principale.

p) deux vannes à siège incliné assurant le by-pass du sécheur lors de l'opération de coulée ; le pilotage de ces vannes n'est pas assuré par le coffret de commande CHAUMECA GOHIN mais le câblage est repris dans la connectique HARTING fournie.

q) un filtre dépollueur FD40F.

r) un châssis principal muni de quatre anneaux de levage.

The dryer includes :

a) Two drying columns (C1 & C2): columns in carbon steel calculated for design pressure of 10.5 Bar. The heads of these columns are equipped with a loading hole and/or ADECAIR® desiccant discharge hole ; the inlet and outlet pipes are equipped with removable strainers which forbid any ADECAIR® adsorbent discharge and allow air flowrate dispatching in the column section.

b) A change over valve (3 Ways) (D SUP): This change over valve is fitted with a scavenging pipe with a nozzle (diaphragm) and cock. This device allows the regeneration of the adsorbent and the pressurization. There is also another pipe with an automatic ball valve which is used for repressurization. The flow is then higher during these 20 seconds.

Note 1 : one manual valve is installed on the main regeneration line (with diaphragm) and has to be opened in normal use.

Note 2 : First skids have been delivered with a four holes diaphragm. Select the hole following pressure indication. When this working pressure will be known, following skids will be delivered with one diaphragm only.

c) Two using valves (VU1 & VU2): They control compressed air flowrate to be treated on operating vessel (drying). They are double effect and are controlled with a logical « OR » function following position of draining valves.

d) Two pressure gauges (PI1 & PI2): fitted on each column.

e) Two draining pneumatic valves (VPI & VP2): set on lower distributor ensuring the depressurization and columns regeneration (this one being carried out at atmospheric pressure).

f) one supply pipe for pilot air with one valve (HV2) and one filter (F)

g) Two safety valve : mounted on each column.

h) Two exhaust silencers (SIL1 & SIL2).

i) One electric control box (CF) using the electromechanical components of main Europeans constructors and according to electric norms in force (EN 60204/1).

j) One support frame for the dryer

Also for the whole skid:

k) One air cooler GEA ERGE SPIRALE, see technical informations in this dossier.

l) One 3 levels separator in stainless steel.

m) One pressure switch HERION.

n) One manometer on the main line.

o) One thermometer on the main line.

p) Two seat valves ensuring by-pass of the dryer during tapping phase; our electric box does not control these valves even if cabling goes through the HARTING plug.

q) One demister filter FD40F.

r) One base frame for the whole skid, equipped with four lifting lugs.

8. REGENERATION DE L'ADSORBANT ADECAIR® I.I REGENERATION OF THE ADSORBENT ADECAIR® I.I

La régénération de l'adsorbant ADECAIR® du sécheur **CLASSIC A770 SP** est assurée par la dépressurisation d'une part, et par le prélèvement d'une partie du débit d'air séché d'autre part.

La valeur de ce prélèvement est calibrée par le passage au travers du diaphragme (FO).

*The regeneration of desiccant ADECAIR® of dryer **CLASSIC A770 SP** is ensured by depressurization and by taking off part of dried air flowrate.*

This value is calibrated by crossing through diaphragm (FO).

9. DEROULEMENT DU CYCLE DE FONCTIONNEMENT DU SECHEUR CYCLE PROGRESS

Le cycle complet du sécheur sans chaleur **CLASSIC A770 SP** se déroule en 2 fois 1 minute.

Demi-cycle A : séchage colonne C1 et régénération colonne C2.

Demi-cycle B : séchage colonne C2 et régénération colonne C1.

Chaque demi-cycle se décompose en 4 phases

- **Phase A1** - Colonne C1 en séchage
Dépressurisation de la colonne C2 par ouverture de la vanne VP2
- **Phase A2** - Pendant 40 sec, balayage et régénération de la colonne C2
- **Phase A3** - Repressurisation de la colonne C2 par fermeture de la vanne VP2
- **Phase A4** - Attente d'inversion en équipression sur les 2 colonnes

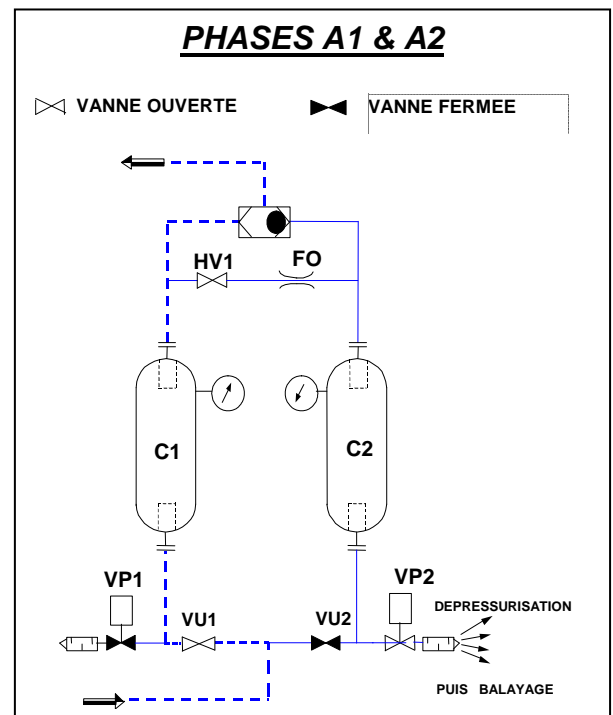
Pour le demi-cycle suivant, on considère les phases B1 à B4, à la différence près des affectations des colonnes : C2 en séchage et C1 en régénération.

The complete cycle of dryer runs out in twice 1 minute.

Every half-cycle includes 4 phases:

- Phase I: Column S1 in drying

Depressurization of column S2 by opening of valve VR2.

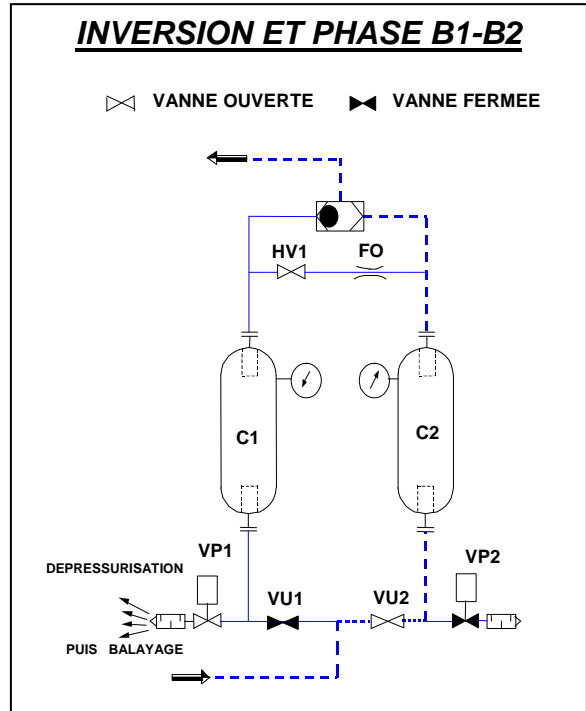
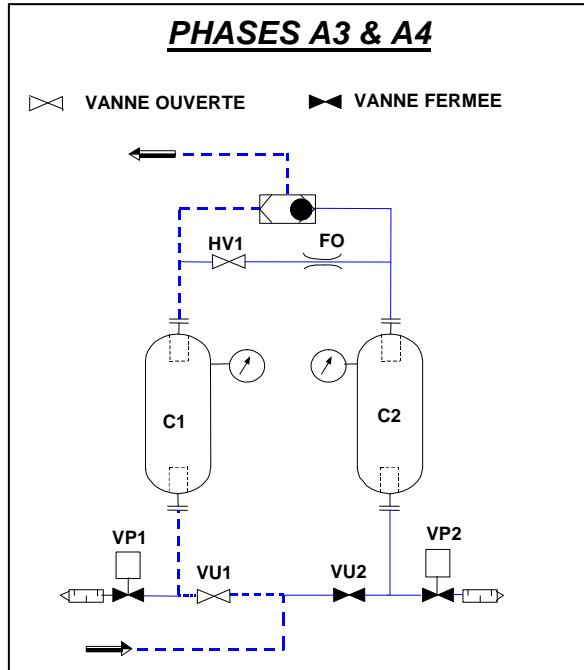


- **Phase 2:** During 40 seconds, scavenging and regeneration of column S2.

- **Phase 3:** Repressurization of column S2 by closing of valve VR2.

- **Phase 4:** Waiting reversal in equipressure on both columns.

Same half cycle with S1 in regeneration and S2 in drying.



10. ENTRETIEN DU SECHEUR CLASSIC A770 SP **SKID MAINTENANCE**

■ 1 - Tous les mois, vérifier :

- Le fonctionnement cyclique
- L'étanchéité des vannes à boisseau sphérique sur le collecteur inférieur.
- Les paramètres de fonctionnement : Pression, température d'entrée, débit traité, débit de balayage, absence d'entraînement vésiculaire.
- L'état du filtre installé en aval du sécheur.

■ 2 - Tous les ans :

- Vérifier l'état des électrovannes de purge.
- Remplacer les joints et garnitures des clapets des distributeurs.
- Vérifier le coffret de commande : serrage des bornes.

■ 3 - Tous les 2 ou 3 ans (pour une utilisation continue) :

Remplacer le produit adsorbant. Pour se faire :

- arrêter le sécheur
- isoler (vannes)
- La vidange se fera par l'orifice inférieur.
- Le remplissage se fera par l'orifice de remplissage supérieur.
- Remplir complètement les deux colonnes.

■ 4 - Dispositif de filtration

Un filtre dépoussiéreur est installé en aval du sécheur, il est absolument impératif de veiller régulièrement à l'entretien de ce matériel et notamment de pourvoir au remplacement de la cartouche filtrante.

■ 1 - Every month, check :

- The cycle running.
- The draining electro valves tightness when the corresponding columns are under pressure.
- The distributor check-valves tightness. The cock HV allows this operation in closing scavenging strap.
- The running parameters: pressure, inlet temperature, treated flowrate, scavenging flowrate, lack of vesicle carrying.
- The filters set up or down dryer (see eventually herewith filters manual).

■ 2 - Every year :

- Check the state of draining electro valves.
- Replace the gaskets of distributor check-valves.
- Check the control box: terminals screwing up.

■ 3 - Every 2 or 3 years :

Replace the desiccant.

■ 4 - Filtration device :

An antidust filter is installed after the dryer, it is absolutely necessary to check regularly the maintenance of these apparatus and

II. ENTRETIEN DU FILTRE FILTER MAINTENANCE

Entretien : les filtres couramment livrés sur nos installations, sont équipés de cartouches dont il convient de surveiller l'état d'encrassement et de remplacer régulièrement, tous les 6 mois.

Le remplacement de la cartouche s'effectue comme suit :

- Isoler le filtre du reste de l'installation et **réduire la pression à zéro** en ouvrant le purgeur manuel.
- Dévisser la cloche. Si la pression interne n'est pas à zéro, l'air s'échappe par le trou de sécurité; revisser la cloche et rouvrir le purgeur manuel.
- Enlever la cartouche encrassée.
- Nettoyer la partie cylindrique de la tête sur laquelle on glisse la cartouche.
- Nettoyer le filetage de la tête, de la cloche et la partie interne de la cloche.
- Graisser avec de l'huile ou de la graisse silicone le joint O'ring de la nouvelle cartouche, la partie cylindrique de la tête sur laquelle on glisse la cartouche, le joint O'ring de la cloche, le filetage de la tête et de la cloche ainsi que la partie cylindrique au dessus du filetage.
- La lubrification des joints O'ring et des filetages est **indispensable** pour ne pas sectionner les joints O'ring, pour faciliter la mise en train de la cloche sur la tête, pour empêcher la formation d'oxyde et favoriser le futur dévissage de la cloche.
- Présenter la nouvelle cartouche qui sera bloquée par la cloche.
- Visser la cloche jusqu'à son blocage.

Purge manuelle du filtre grade F

La purge se fait par un robinet de purge manuelle. Il est possible d'évacuer manuellement les éventuels condensats par la petite molette sous le filtre.

Pièces de rechange

Vous trouverez en partie 5 du présent dossier, la liste des pièces de rechange que nous vous recommandons de tenir en stock pour assurer l'entretien de ces matériels.

Nous insistons sur l'importance d'être assuré que nos filtres sont équipés de **cartouches filtrantes d'origine constructeur**. Seuls ces matériels, étudiés testés et construits spécialement pour les filtres FD, permettent d'être certain du bon fonctionnement du filtre.

It is normal that the pressure drop goes up for a brief period after starting but this one must become stable quickly to balanced point.

Progressively, according to filtering cartridges clogging, the pressure drop is increasing. When the warning level is reached, replace filtering cartridges.

For FD 40 using at design conditions, the cartridge replacing must be carried out every 6 months of using.

Proceed as follow :

- Isolate the apparatus.
- Blow it off of pressure gas it contains

- Take off the bolts then the upper plate.
- Take off the clogged cartridges.
- If necessary, clean the filter body.
- Replace the cartridges and the joints.
- Raise the upper plate.
- Start again.
- Check the good drain running.

Manual drain on filter FD40F: Drain can be made with a manual valve under the filter.

Spare parts: You will find in part 5 of this dossier the whole spare parts list for this skid. It is highly recommended to keep in stock all these pieces to ensure good maintenance of the skid.

We also insist on the importance to replace cartridge of filter FD40F by the same reference initially installed. These cartridges have been designed, studied and tested specifically for FD filters to ensure good working conditions and performance.

12. CONDITIONS DE GARANTIE *CONDITIONS FOR GUARANTEE*

Nos sècheurs sont garantis un an contre tout vice de construction éventuel (sauf convention particulière). L'application de conditions de garantie est définie par les Conditions générales intersyndicales de vente pour la France de la "Fédération des Industries Mécaniques et Transformatrices de Métaux".

Cette garantie ne s'applique pas aux produits "consommables" et n'est valable que si l'appareil est installé et utilisé conformément à la présente notice et bien entendu conformément aux conditions prévues dans notre accusé de réception de commande.

Our dryers are warranted one year against any manufacturing vice (except special clause). The application of warranted conditions is defined in « General trade-union sales conditions in France from Federation of mechanical industries ».

This warranty applies to « consumable products » and it is valid only if apparatus is set and used in accordance with present manual and design conditions written in our acknowledgment.

13. INCIDENTS DE FONCTIONNEMENT WORKING ANOMALIES

CAUSES POSSIBLES	VERIFICATION A EFFECTUER
------------------	--------------------------

1) POINT DE ROSEE TROP ELEVE

Débit de balayage insuffisant	Contrôler le débit de purge requis, le cas échéant, changer le diaphragme. Vérifier qu'il n'y a pas de contre pression aux purges.
Pression d'entrée inférieure aux spécifications	Le rendement diminue avec la pression. Vérifier l'ensemble des conditions d'emploi. Changer le diaphragme.
Débit traité supérieur aux spécifications	Le ramener aux conditions prévues ou nous contacter.
Pénétration de liquide à l'entrée de gaz humide	Vérifier le circuit d'alimentation : état des réfrigérants condenseurs et des purges des compresseurs. Vérifier le déshuileur ou dévésiculeur.
T° d'entrée > aux spécifications	Vérifier les réfrigérants des compresseurs.
Déshydratant détruit	Remplacer l'adsorbant. Eventuellement éliminer les entraînements d'huile ou éviter les rafales.
By-pass défectueux	Vérifier que le by-pass est bien fermé et étanche.
Défaut cyclique	Voir chapitres 6 et 9

2) PERTE DE CHARGE TROP ELEVEE

Débit traité > aux spécifications	Le ramener aux conditions prévues ou nous contacter.
Colmatage de l'adsorbant	Remplacer l'adsorbant. Vérifier les purges et s'il n'y a pas d'entraînement liquide.
Pression d'entrée < aux spécifications.	La ramener à une valeur correcte ou monter un déverseur en aval.

3) CONTREPRESSION SUR LA COLONNE EN REGENERATION

Vanne de purge bloquée fermée	Vérifier le clapet de la vanne, le nettoyer, vérifier l'évacuation. Vérifier les électrovannes pilotes.
Distributeurs fuyards	Les vérifier. Nettoyer les portées des clapets. Eventuellement remplacer les joints et garnitures des clapets.
Silencieux colmatés	Les remplacer

CAUSES POSSIBLES	VERIFICATION A EFFECTUER
------------------	--------------------------

4) DEFAUT DE DISTRIBUTION

Absence de courant	Vérifier le circuit électrique (en un tel cas l'écoulement de gaz se fait dans une seule colonne en permanence).
--------------------	--

	Vérifier l'allumage d'au moins 1 voyant en façade du coffret électronique.
Vannes pneumatiques de purge	Vérifier leur fonctionnement, les nettoyer, éventuellement les changer. Vérifier les électrovannes pilotes.
Distributeurs défectueux	Les vérifier. Nettoyer les portées des clapets. Si nécessaire remplacer les joints et garnitures des clapets.

POSSIBLE CAUSES	CHECKING TO BE OCCURRED
------------------------	--------------------------------

1) DEW POINT TOO HIGH

<i>Insufficient scavenging flowrate.</i>	<i>Check the required purge flowrate and, if necessary, change the diaphragm. Check there is no back-pressure in purges.</i>
<i>Inlet pressure below specifications.</i>	<i>The yield diminishes with pressure. Check through the set of operating conditions. Change the diaphragm.</i>
<i>Treated flow higher than specifications.</i>	<i>Bring it down to the design value or contact CHAUMECA GOHIN.</i>
<i>Inlet penetration of liquid by moist gas.</i>	<i>Check the feed circuit: the condition of the condenser refrigerating and the compressor purgings. Check the deoiler and the demister.</i>
<i>Inlet temperature higher than specifications.</i>	<i>Check the compressor refrigerating circuit.</i>
<i>Desiccant exhausted.</i>	<i>Replace it. It is possible to eliminate oil entrainments or to avoid gusting gas.</i>
<i>Defective by-pass.</i>	<i>Check that is closed and airtight.</i>
<i>Problems in the cycle.</i>	<i>See chapter 7.</i>

2) PRESSURE DROP HIGHER

<i>Treated flow higher than specifications.</i>	<i>Bring it down to the design level or contact CHAUMECA GOHIN.</i>
<i>Desiccant clogged up.</i>	<i>Replace the desiccant. Check the purges and be sure there is no entrainment of liquid.</i>
<i>Inlet pressure lower than specifications.</i>	<i>Reduce it to the correct level or set up a post-dryer tank below.</i>

3) BACK-PRESSURE IN THE REGENERATION COLUMN

<i>Purge valve blocked closed.</i>	<i>Inspect the clack valve, clean it. Inspect the evacuation.</i>
<i>Run-away distributors.</i>	<i>Check them. Clean the check valve spans. Eventually, replace joints.</i>
<i>Clogged exhaust reducers.</i>	<i>Replace them.</i>

4) DISTRIBUTION PROBLEMS

<i>Lack of power</i>	<i>Check the electric current (in such a situation, gas flows through one of column). Check lighting of 1 warning light at least of electronic box.</i>
<i>Purging valves.</i>	<i>Check their operation. Clean them. Eventually replace them.</i>
<i>Defective distributors.</i>	<i>Check them. Clean the check valve spans. If necessary, replace the joints.</i>

14. FICHE DE SECURITE PRODUIT ADSORBANT ADECAIR® I.I
SECURITY SHEET FOR ADSORBENT ADECAIR® I.I

PRODUIT ADSORBANT ADECAIR I.I

1 - Identification du produit

1.1 Nom du produit : **ADECAIR I.I**
1.2 Qualité : Billes
1.3 Fournisseur :
Nom : S.A. CHAUMECA GOHIN
Adresse : Postale : BP 114 59482 HAUBOURDIN Cedex
Géographique: 3, avenue de Lassus 59320 HAUBOURDIN
Téléphone : 03.20.18.05.18
Télécopie : 03.20.18.05.19
E-mail : contact-chgh@chaumeca.com

2 - Composition/Informations sur les composants

2.1 Nom chimique usuel (ou nom générique) : Alumine
2.2. Indications complémentaires : Hydrate à 3 H₂O
2.3. CAS : 1344-28-1
2.4. Constituants contribuant aux dangers : néant

3 - Identification des dangers PRINCIPAUX DANGERS

3.1 Effets néfastes sur la santé :
Légèrement irritant pour les yeux et les voies respiratoires

3.2 Dangers physiques et chimiques
- Incendie ou explosion :
Ne présente PAS de danger particulier d'incendie ou d'explosion.

3.3 Risques spécifiques :
Ce produit n'est pas classé comme « substance dangereuse » selon les critères CEE.

3.4 Informations complémentaires :
En cas de déversement accidentel, peut rendre le sol très glissant.

4 - Premiers secours

4.1 Inhalation :
Amener au grand air
Consulter éventuellement un médecin

4.2 Contact avec la peau :
Rincer à l'eau

4.3 Contact avec les yeux :
Rinçage à l'eau IMMEDIAT et prolongé en maintenant les paupières bien écartées (15 minutes au moins).
En cas d'irritation persistante, consulter un ophtalmologiste.

4.4 Ingestion :
Rincer la bouche à l'eau
Consulter éventuellement un médecin.

5 - Mesures de lutte contre l'incendie

5.1 Moyens d'extinction :
- Appropriés : tous les agents d'extinction sont utilisables.
- Déconseillés : aucun, à notre connaissance. En cas d'incendie à proximité, utiliser les agents d'extinction adaptés.

5.2 Dangers spécifiques :
Produit réfractaire ; ne présente pas de risque particulier en cas d'incendie.

6 - Mesures à prendre en cas de dispersion accidentelle

6.1 Précautions individuelles :

Eviter le contact avec les yeux. Ne pas respirer les poussières.

6.2 Précautions pour la protection de l'environnement :

Produit ne présentant pas de risque particulier pour l'environnement.

6.3 Méthodes de nettoyage

- Récupération : Ramasser mécaniquement le produit par aspiration et/ou par balayage.
- Nettoyage/décontamination : Si nécessaire laver à l'eau après ramassage.

6.4 Autres informations :

Ce produit, sous forme de billes, peut rendre le sol très glissant.

7 - Manipulation et stockage

7.1 Manipulation :

- Mesures techniques : Ne nécessite pas de mesure technique spécifique ou particulière.
- Précautions à prendre : Éviter la formation de poussières.
- Conseils d'utilisation : Respecter les conditions d'emploi (se référer à la notice technique).

7.2 Stockage :

- Mesures techniques : Ne nécessite pas de mesures techniques spécifiques ou particulières.
- Conditions de stockage recommandées : Pour garantir la qualité et les propriétés du produit, conserver à l'abri de l'humidité et des intempéries.
- Matières incompatibles : acides
- Conditions d'emballage : produit pouvant être conditionné dans des emballages commerciaux courants.
- Matériaux d'emballage recommandés : acier, matières plastiques
- Matériaux d'emballage contre-indiqués : fer.

8 - Contrôle de l'exposition/protection individuelle

8.1 Mesures d'ordre technique :

Ne nécessite pas de mesures spécifiques ou particulières, sous réserve de respecter les règles générales de sécurité et d'hygiène industrielle.

8.2 Paramètres de contrôle – Valeurs limites d'exposition

- Valeurs limites (France) :
Poussières totales- VME : 10 mg/m³
Poussières alvéolaires – VME : 3 mg/m³
- Valeurs limites (U.S.A. / A.C.G.I.H.) :
Poussières totales- TLV (TWA) : 10 mg/m³
Particules respirables – TLV (TWA) : 3 mg/m³

8.3 Équipements de protection individuelle

- Protection respiratoire : appareil de protection respiratoire filtrant anti-particules.
- Protection des yeux : Lunettes de sécurité avec protections latérales.

9 - Protections physiques et chimiques

ASPECT

9.1 État physique : Solide

9.2 Forme : Billes

9.3 Diamètre : 2 mm
5 mm

9.4 Couleur : Blanc

9.5 Odeur : Inodore

9.6 pH : Non applicable (produit insoluble)

9.7 Températures caractéristiques.

- Fusion : > 2000°C

9.8 Caractéristiques d'inflammabilité

- Point d'éclair : Non applicable (solide non inflammable)

9.9 Propriétés comburantes : Non comburant selon les critères CEE.

9.10 Masse volumique apparente : 0.8 kg/dm³ (produit tassé)

9.11 Solubilité dans l'eau : Pratiquement insoluble

9.12 Solubilité dans les solvants organiques : Produit insoluble dans les solvants organiques usuels.

10 - Stabilité et Réactivité

10.1 Stabilité : Produit réfractaire ; stable à haute température.

10.2 Réactions dangereuses :

- Conditions à éviter : Pas de réaction dangereuse connue dans les conditions normales d'emploi. Se reporter à la notice technique.
- Matières à éviter : acides forts, bases fortes

11. Informations toxicologiques

Toxicité aiguë

Effets locaux : Légèrement irritant pour les voies respiratoires.

Légèrement irritant pour les yeux.

12- Informations écologiques

12.1 Devenir dans l'environnement

- Mobilité : Produit peu soluble, sédimentant facilement.
- Persistance/Dégradabilité : Produit minéral inerte. Non dégradable.
- Bioaccumulation : Très peu bioaccumulable.
- Compartiment cible du produit : Compartiment cible ultime du produit : SOL et SEDIMENTS.

13 - Considérations relatives à l'élimination

13.1 Résidus du produit

- Destruction/Élimination : peut être éliminé avec les déchets industriels banals.

13.2 Emballages souillés :

- Décontamination/nettoyage : vider complètement les emballages avant recyclage.
- Destruction/Élimination : réutiliser ou recycler après lavage.
- Autres données : Les catalyseurs usés peuvent présenter des risques ou des propriétés différentes par rapport aux produits d'origine. Cette fiche de données de sécurité ne concerne pas les catalyseurs usés.

13.3 Remarque : L'attention de l'utilisateur est attirée sur la possible existence de contraintes et de prescriptions locales, relatives à l'élimination, le concernant.

14 – Informations relatives au transport

14.1 Réglementations internationales

- Voies terrestres : Rail/route (RID/ADR) : NON réglementé
- Voie maritime (OMI/IMDG) : NON réglementé
- Voie aérienne (OACI/IATA) : NON réglementé.

14.2 Autres réglementations

- France : Rail/route (RID/ADR) : NON réglementé

14.3 Remarque : Les prescriptions réglementaires reprises ci-dessus, sont celles en vigueur le jour de l'actualisation de la fiche. Mais, compte-tenu d'une évolution toujours possible des réglementations régissant le transport des matières dangereuses, il est conseillé de s'assurer de leur validité auprès de votre agence commerciale.

15 - Informations réglementaires

15.1 Étiquetage

- Réglementations CEE : Étiquetage obligatoire des substances dangereuses (Auto-classification) : Non concerné.

15.2 Note :

Les informations réglementaires reprises dans cette section rappellent uniquement les principales prescriptions spécifiquement applicables au produit objet de la FDS. L'attention de l'utilisateur est attirée sur la possible existence d'autres dispositions complétant ces prescriptions. Il est recommandé de se référer à toutes mesures ou dispositions, internationales, nationales ou locales pouvant s'appliquer.

16 Autres informations

16.1 Utilisations recommandées :

(Pour plus de détails, se reporter à la fiche technique).

- Formule chimique : Al_2O_3
- Numéro d'enregistrement : N° EINECS : 215-691-6
- Inventaire européen (EINECS, ELINCS) : Inscrit dans l'inventaire EINECS.

Les renseignements que la fiche contient sont basés sur l'état de nos connaissances relatives au produit concerné, à la date de mise à jour. Ils sont donnés de bonne foi. L'attention des utilisateurs est en outre attirée sur les risques éventuellement encourus lorsqu'un produit est utilisé à d'autres usages que ceux pour lesquels il est conçu. Elle ne dispense en aucun cas l'utilisateur de connaître et d'appliquer l'ensemble des textes réglementant son activité. Il prendra sous sa seule responsabilité les précautions liées à l'utilisation du produit qu'il connaît. L'ensemble des prescriptions réglementaires mentionnées a simplement pour but d'aider le destinataire à remplir les obligations qui lui incombent lors de l'utilisation d'un produit dangereux. Cette énumération ne doit pas être considérée comme exhaustive. Elle n'exonère pas l'utilisateur de s'assurer que d'autres obligations ne lui incombent en raison de textes autres que ceux cités et régissant la détention et l'utilisation du produit, pour lesquelles il est seul responsable.

**Service établissant la fiche technique :
SA CHAUMECA GOHIN Haubourdin (Nord)**

ADSORBENT SAFETY SHEET ADECAIR I.I

1 - Product identification

1.4 Product name: **ADECAIR I.I**
1.5 Supplier:
Name: S.A. CHAUMECA GOHIN
Address: 3 Avenue de Lassus - BP70114 59482 HAUBOURDIN Cedex (France)
Phone: +33 (0) 3 20 18 05 18
Fax: +33 (0) 3 20 18 05 19
E-mail: contact-chgh@chaumeca.com

2 - Composition/Information on the components

2.1 Common chemical name (or generic name)

- N° CASE : 1344-28-1
- N° EINECS : 2156916

3 - Identification of dangers

The desiccant **ADECAIR I.I** is not dangerous for users or for environment.

4 - First aid

The desiccant **ADECAIR I.I** does not require specific treatment.

5 - Battle measures with the fire

In case of fire, only the usual protecting measures of environment are to be taken in account.

6 - Measures to be taken in case of accidental dispersion

- 6.1 The desiccant **ADECAIR I.I** is hydrophilic. In case of dispersion, the resulting dust from it will feel dryness. It is necessary to put a mask.
6.2 The desiccant **ADECAIR I.I** is packed in balls. In case of dispersion, be careful to falls.

7 - Handling and storage

7.1 Handling:

- Precautions to be taken: no required particular measure except above precautions towards dust inhalation and risks of falls.
- Prevention of fires and explosions: this product is not combustible.

7.2 Storage:

- Requirements for place and contents: store in dry premise.

8 - Exposure checking / individual protection

8.1 Individual protection equipment:

- See paragraph 6 of present chapter.

9 - Physical and chemical protections

9.1 Form: Solid in balls
9.2 Color: White
9.3 Smell: Inodorous

9.4 Modification of condition:

- Melting-point : > 2000 °C
- Boiling-point : undetermined
- Flash point : the product is not explosive

9.5 Density at 20°C : 3.2 g/cm³

9.6 Loose density at 20°C : 770 kg/m³

9.7 Solubility in water : insoluble

9.8 PH: inapplicable (insoluble product)

10 - Stability and reactivity

10.1 *Thermal decomposition*: no-decomposition during using

10.2 *Dangerous reactions*: a reheating occurs in case of water addition

10.3 *Dangerous decomposition products*: no known dangerous decomposition products

11. Toxicological information

The desiccant **ADECAIR I.I** does not present any particular toxicological risk.

It is not subjected to marking in accordance with CEE lists in operation.

12- Ecological information

12.1 *General indications*:

- Category of water pollution 0 (clean classification) : generally no polluting.

13 - Considerations about elimination

13.1 *Product*:

- Recommendation: it can be put in dump with household refuses on condition to respect technical prescriptions and after agreement of competent authorities.

13.2 *Refuse code*: 513 05

13.3 *Packings non-clear*:

- Recommendation: the packing must be evacuated in accordance with rules on packings.

14 - Carriage prescriptions

14.1 *Carriage fuller indications*: no dangerous product according to above dispositions.

15 - Prescribed information

15.1 *Marking according to rules of conduct CEE*: the substance is not subject to marking obligations of CEE.

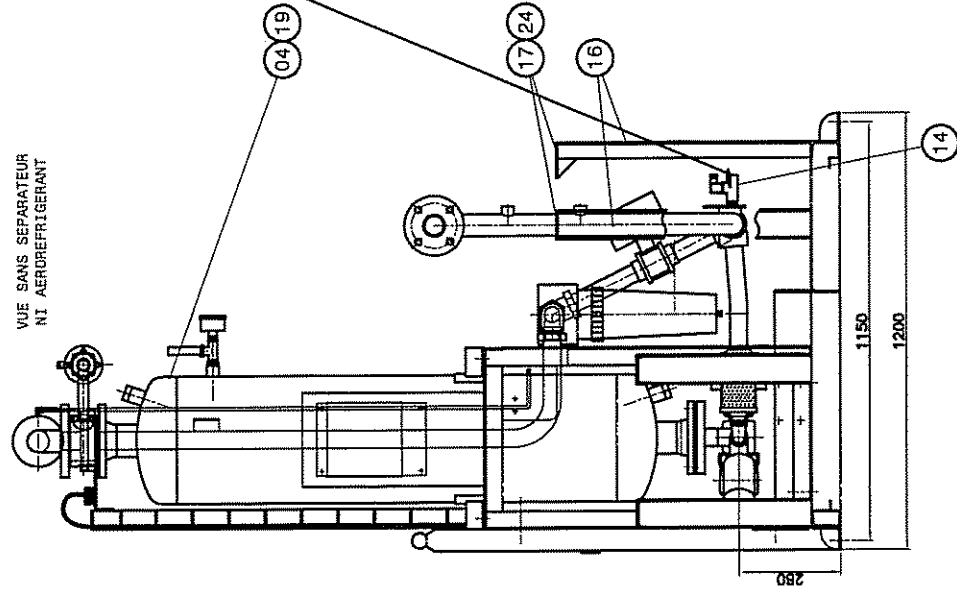
16 - Other information

These information are based on the production knowledge but they don't constitute a warranty about the product properties and don't give occasion to any juridical report.

Department writing technical sheet:
SA CHAUMECA GOHIN Haubourdin (North)

NOTASUR LES REVETEMENTS :
- 2 couches de primaire impression phosphatante série 60036 - épaisseur : 2*40 µm - couleur RAL 1023

- POIDS : 1250 KG ENVIRON
WEIGHT : 1250 KG APPROXIMATELY



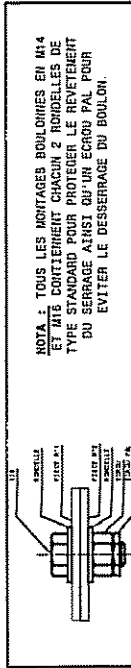
REGLAGE DU PRESSOSTAT A 5.5 BAR
PRESSURE SWITCH SETTING TO 5.5 BAR

434594	27	18	ECROU PAL DE 16		ACTIER ZINGJEE
434161	26	4	BOULON H M6 x 20 + 8 RONDCELLES GROVER M6		CLASSE 8.8 ZINGJEE
261952	25	1	ETRIER M30 POUR FILTRE F040 F		
434298	24	2	BOULON M16 x 40 + 4 RONDCELLES M16		CLASSE 8.8 ZINGJEE
434304	23	4	BOULON M16 x 70 + 8 RONDCELLES M16		CLASSE 8.8 ZINGJEE
434195	22	10	BOULON M10 x 30 + 20 RONDCELLES GROVER M10 INOX		CLASSE 8.8 ZINGJEE
342011	21	1	JOINT POUR BRIDE PH16 D140 - Ø94 x Ø19 x 2		BA-F
342013	20	2	JOINT POUR BRIDE PH16 D150 - Ø107 x Ø61 x 2		BA-F
434298	19	8	BOULON M16 x 40 + 8 RONDCELLES ELASTIQUES Ø106LLES M16		CLASSE 8.8 ZINGJEE
434304	18	8	BOULON M10 x 70 + 16 RONDCELLES M10		CLASSE 8.8 ZINGJEE
411305	17	2	TOLE EP 5 MM DIMENSIONS : 1x (80x45) + 1x (100x80)		P265GH
486340	16	2	FER UPT 80 - LG UNITAIRE : 695 MM ENVIRON		S355J2G3
226340	15	1	PLAQUE IDENTIFICATION SECHEUR CLIENT		INOX
384235	14	1	PRESSOYAT NORGREEN 1BD - 1/4" G42		
371202	13	1	MAROMETRE 0-10 BAR 603		INOX
414087	12	1	THERMOMETRE EDERRE 90° - Ø 6 x 120°C - 1/2" G		MTO
430328	11	1	VANNE 1 1/2 SW NORMALEMENT OUVERTE		
430327	10	1	VANNE 2" SW NORMALEMENT FERMEE		
411360	09	3	BARRE TOLPICOT - LG UNITAIRE = 4m DIM : (4x 1250 mm) + (4x 1010 mm) + (1x 801mm)		ACTIER
204005	08	4	ANNEAUX DE LEVAGE 245 M20 D1650 C100 = 1200 Kg		L'ETOILE
2670001W4	07	1	MONTAGE DECOMAT 13C0		PL-30833
26700140X5	06	1	TUYAUTERIE DE LIAISON		PL-31415
055140	05	1	FILTRE F040 F		
26700140X10	04	1	SECHEUR CLASSIC A770 SP		PL-31414
060030	03	1	SEPARATEUR K1060 SP		PL-31391
402624	02	1	CHASSIS PRINCIPAL		PL-31379
2670001W21	01	1	AEROREFRAIGERANT Ø160		GEA PL-30833
N° COLLEE	CODE	REP	DESIGNATION		MATIERE
		NB			

NOTA :
LE SEÇEUR N'EST PAS A REMPLIR. IL PARTIRA AVEC DES CHARGES D'ADSORBANT ET SERA REMPLI PAR LE CLIENT.

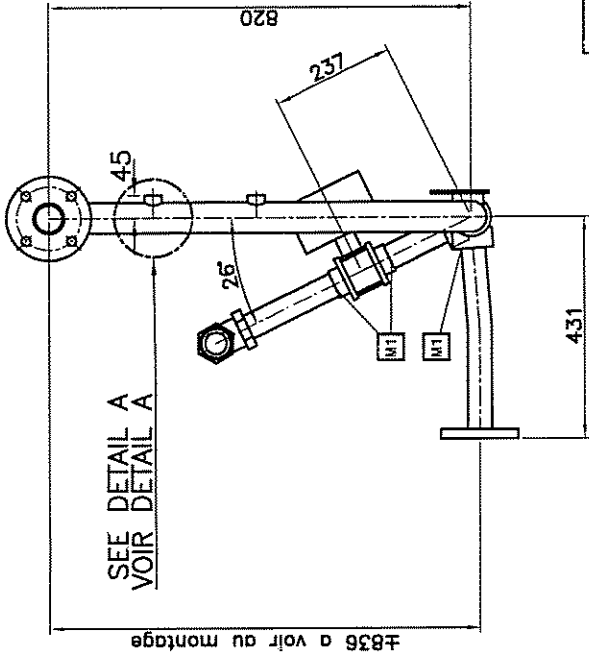
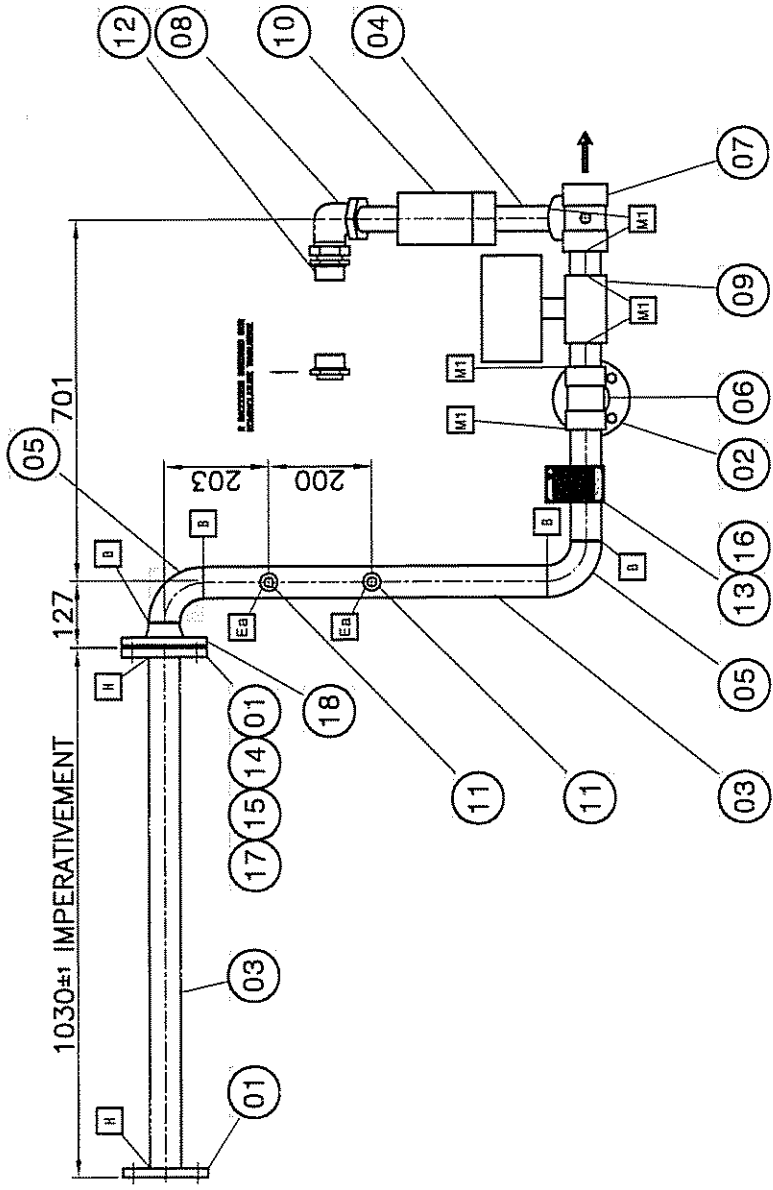
DON'T FILL DRYER COLUMNS. DRYER WILL
GO WITH ADSORBANT CHARGES AND WILL BE
FILL BY COSTUMER.

IMPORTANT :
LE FILTRE DE SORTIE SECHEUR NE DOIT PAS ETRE EQUIPE DE SON MANOMETRE DIFFERENTIEL AU MONTAGE. IL FAUT LE REINTEGRER AU STOCK.

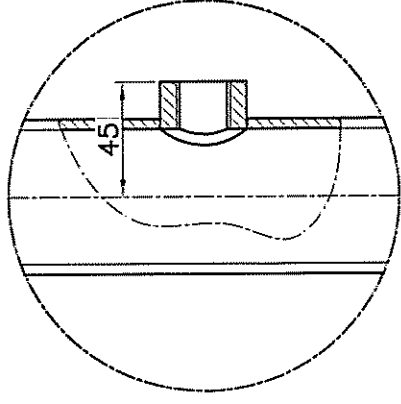


Les pieds sont à peindre en rouge
(Legs are painted in red)
GAMA KYD Série 30000 - épaisseur

[illegible]

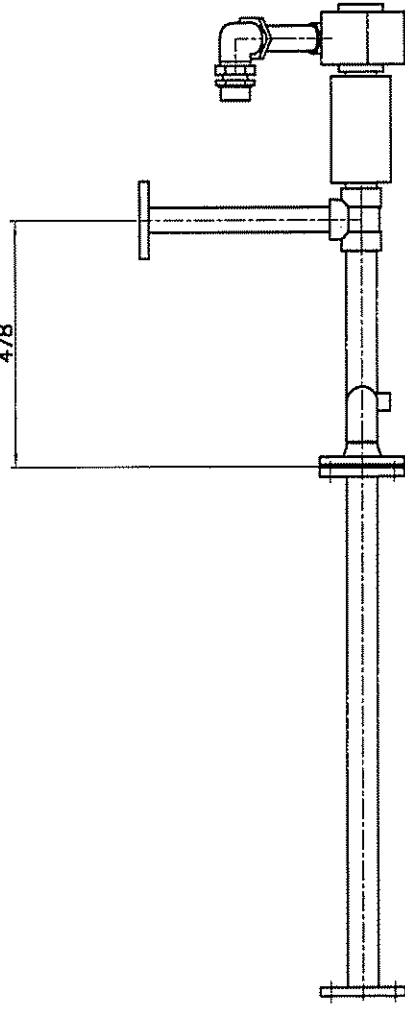


DETAIL A



223616	18	1	BRIDE PN16 DN50 11B - ep 4 mm	P245GH	NF EN 10222-2
434594	17	4	FLANGE NP16 DN50 11B - th 4 mm	ACIER	
226342	16	1	ECROU PAL DE 16	INOX	
434302	15	4	HEXAGONAL "PAL" LOCK NUT M16	CLASSE 8.8	
342013	14	1	PLAQUE DE FIRM	ZINGUEE	
495502	13	1	+ 4 RIVETS POP 03 LGB INOX	BA-F	
2970014807	12	2	BOULON M16 x 60	P265GH	NF EN 10028-2
650007	11	2	JOINT POUR BRIDE PN16 DN50 - Ø107 x Ø61 x 2		
430328	10	1	PONNET PLAQUE DE FIRM		
430327	09	1	ADAPTATEUR MALE AMAC JN 1 1/2 G1 1/2B CYL	PL.31425	
435230	08	1	+ USINAGE A PARTIR DE L'ARTICLE 435231	TU E 250 B	NF A 49-211
2970014805	07	1	MANCHON Rp 1/2" GAZ		
392446	06	1	VANNE 1 1/2 SW NO		
420110	05	2	VANNE 2" SW NF		
420728	04	-	COUDE VEBO FF 1 1/2		
420731	03	-	TE SPECIAL 2" SW 1 1/2 SW, 2" GAZ	A105N	PL.31424
223260	02	1	+ USINAGE A PARTIR DE L'ARTICLE 392447	A105	
223262	01	2	TE REDUIT 2" - 1 1/2 SW	AE 250	NF A 49-281
			COUDE 3090° Ø60.3 EP 4	P265GH	NF EN 10216-2
			TUBE Ø48.3 EP 3.6	P265GH	NF EN 10216-2
			TUBE Ø60.3 EP 4	P265GH	NF EN 10216-2
			BRIDE ISO PN16 DN40 O1A	BF 42	NF E 29203
			BRIDE ISO PN16 DN50 O1A	P265GH	NF EN 10028-2
				NORME-OBS	N° PLAN

CHAUMECA GOHIN		PROFESSIONNEL IN COMPRESSED GAS TREATMENT FOR INDUSTRY	
APPARATUS	TUYAUTERIE	ORDER	DRAWING
CODE	STANDARD CONSTRUCTEUR	APR 353	XXXXX
Nb n°	DESP 97/23/CE	APPR	XXXXX
YEAR	2009	CORROSION	1 mm
BUILDER	CHAUMECA GOHIN	FLUID/GROUP	AIR/2
RISK CAT.	ORDER	TEMPERATURE MIN/MAX	0-90 °C
DESIGN	TEMPERATURE	DESIGN TEMPERATURE	90 °C
PRESSURE MIN/MAX	0-10.5 Bar	PRESSURE MIN/MAX	0-10.5 Bar
TEST PRESSURE	17.3 Bar	TEST PRESSURE	17.3 Bar
CAPACITY/DN	DN60	TEST DATE	
3, avenue de la Sève - BP 70114 59482 HAUBOURDIN CEDEX - FRANCE Tel: +33 (0)3 20 18 05 18 www.chaumecca.com			

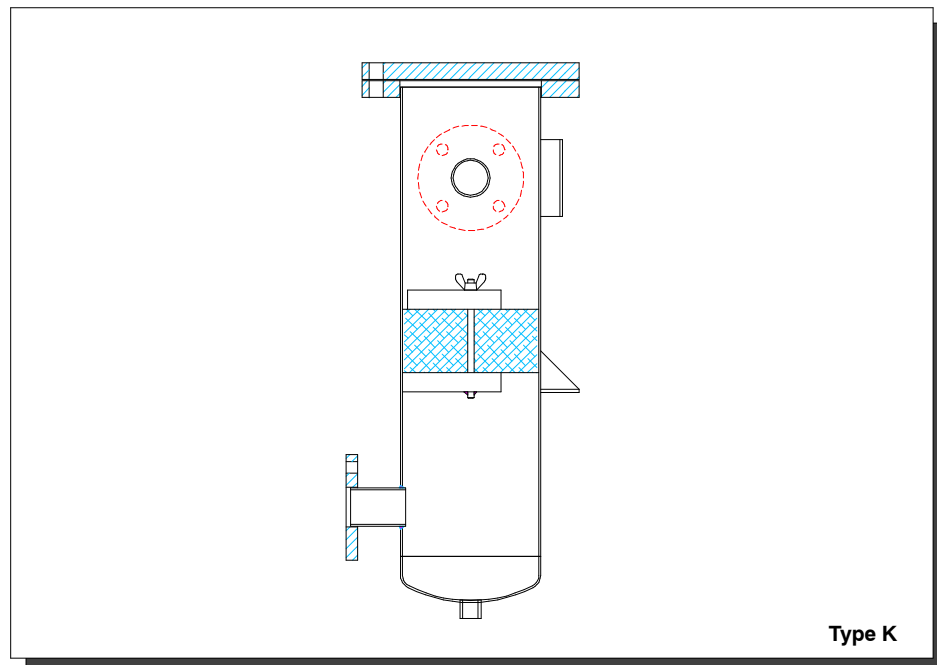


CHAUMECA GOHIN		SIEGE SOCIAL : 3, AVENUE DE LA SEVE - 59482 HAUBOURDIN CEDEX - FRANCE Téléphone : 03 20 18 05 18 Télécopie : 03 20 18 05 18	
LE PROFESSIONNEL DE L'AIR COMPRIME AU SERVICE DE L'INDUSTRIE		Client : ECL	
Customer : HINDALCO		SKID CLASSIC A 770 SP	
Echelle : 1/10		TUYAUTERIE DE LIAISON	
INTERMEDIATE PIPING		N° 31415	
05/11/09		05/11/09	
Date		Date	
Objet		Objet	
ELABORATION		ELABORATION	
Indice		Indice	
DE PLAN ET LA PROPRIETE DE CHAUMECA GOHIN. IL NE PEUT ETRE NI COPIE NI COMMUNIQUE A DES TITRES SANS SON AUTORISATION.			
Type de plan : 31415			

6.16 MANUAL FOR THE CONDENSATES SEPARATOR TYPE K (CHAUMECA)

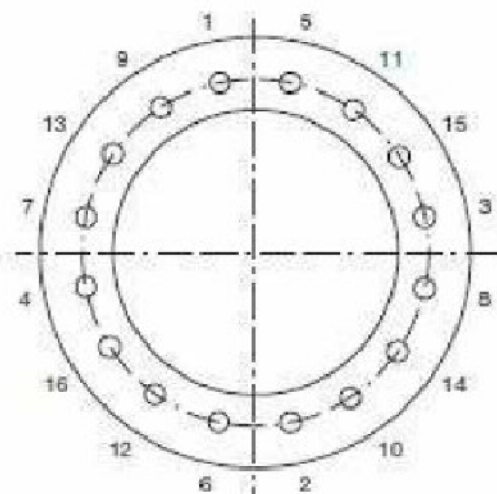
Function	Location	Reference
Condensates separator	Air drying by adsorption	Type K

Safety information : Please refer to the procedure (page 6.16-2) for the flange tightening when maintenance.



How to tight bolts on a flange:

- Screw progressively the bolts on each flange following below sequence:



- The bolts have to be screwed in opposite diameter order (see above: 1 then 2 then 3 then 4....).

- Repeat the sequence a few times until the bolts start to be tight onto the flange.

- 1st step:

Screw at approximately 10% of the bolts maximal admissible torque (based on 6.8 class or applicable class)

- 2nd step:

Screw at approximately 30% of the maximal value.

- 3rd step:

After a minimum of two hours, screw again at 30% of the maximal value in order to compensate the relaxation of the 2nd step clamping force.

- Every bolt has to be tight at the same torque value.

- If needed, tighten the bolts until there is no more leakage during hydraulic pressure test or when ever the machine is working. Make sure every bolt is tighten with the same torque value.

SEPARATEUR DEVESICULEUR SERIE "K"

CONDENSATES SEPARATOR TYPE "K"



IMPORTANT

Cette notice doit être soigneusement lue par toute personne responsable de la maintenance ou susceptible d'intervenir sur cette installation.

This leaflet has to be read by any person in charge of maintenance or installation of this material

MANUEL D'UTILISATION OPERATING MANUAL

1. DESCRIPTION SOMMAIRE / SUMMARY DESCRIPTION

Le séparateur dévésiculeur de la **série K** est constitué d'un corps cylindrique en acier inoxydable renfermant un tampon coalesceur en Monel.

La partie supérieure est démontable et permet l'entretien ou le remplacement éventuel du tampon.

L'entrée de l'air se fait en partie basse de l'appareil, la sortie en partie haute.

The type "K" separator is a mechanical separator using the coalescent properties of a metallic (Monel) buffer of molecular structure.

It is made up of one stainless steel container, with an upper flange and a blind flange.

The inlet is positioned in the lower part, the outlet in the upper part. A set of internal baffle plates direct the air to be treated on to the metallic buffer which is very easy to maintain.

2. MONTAGE / MOUNTING

Le séparateur dévésiculeur de la **série K** se raccorde par l'intermédiaire d'une tubulure à bride, directement au réfrigérant d'air comprimé.

The K type separator is connected by flange to the outlet of the air cooler.

3. FONCTIONNEMENT / OPERATION

Le principe de séparation étant basé sur la coalescence de la phase liquide sur les mailles d'une structure moléculaire, l'évacuation des condensats se fait par intermittence lorsque les forces d'inertie du liquide saturant le tampon deviennent supérieures à celles résultant de l'énergie cinétique du gaz circulant à contre-courant.

A ce moment là, les particules liquides s'écoulent par gravité vers le fond inférieur du séparateur d'où elles sont extraites par le dispositif de purge.

The air easily circulates from bottom to top, with minimum pressure drop through the metallic buffer. The liquid particles it contains are attached through coalescence to the mesh.

The special structure is chosen for gathering large drops which drip down to the bottom of the unit. They are then evacuated by the automatic drain.

4. ENTRETIEN / MAINTENANCE

Le tampon coalesceur assurant à lui seul le bon rendement de la séparation il est donc conseillé de le maintenir en état constant de propreté.

Le démontage du plateau supérieur du séparateur dévésiculeur de la **série K** donne accès au tampon.

Celui-ci peut donc être nettoyé facilement par secouage puis trempage dans de l'eau savonneuse ou produit dégraissant n'altérant pas le métal du tampon suivi d'un rinçage et d'un séchage.

Une telle opération effectuée lorsque la perte de charge est trop importante suffit à maintenir le tampon pour la durée normale de vie de l'appareil sous réserve que d'autres phénomènes de pulsations ou de vibrations ne viennent détériorer le tampon par rupture de ligaments. A noter que le tampon est réalisé en Monel spécialement pour l'application concernée.

As soon as pressure drop through the separator is too high, cleaning and even demister removal must be carried out.

Act as follows :

- *insulate the unit*
- *Take off bolts and the upper part (Blind flange)*
- *Take off demister*
- *Clean it with solvent or soapy, or water change it*
- *Reassemble with a new gasket*

Such an operation is sufficient to keep the demister in good state for a long time, provide that other phenomens (pulsation, vibration) don't trouble it.)

Coalescer element has been specially design for this application.

5. PURGE AUTOMATIQUE / AUTOMATIC DRAIN

Pour qu'il puisse pleinement assurer sa fonction, le séparateur dévésiculeur de la **série K** doit être purgé régulièrement et de façon automatique.

Le purgeur automatique est un élément essentiel du fonctionnement du séparateur dévésiculeur de la **série K**.

Voir la notice spécialement élaborée pour les purgeurs automatiques livrés avec les séparateurs dévésiculeurs de la **série K**.

To assume this function the K type separator has to be regularly and automatically purged.

The automatic drain is an essential equipment of this separator. See BEKOMAT operating manual provided in this dossier for more informations.

6. PIECES DE RECHANGE / SPARE PARTS

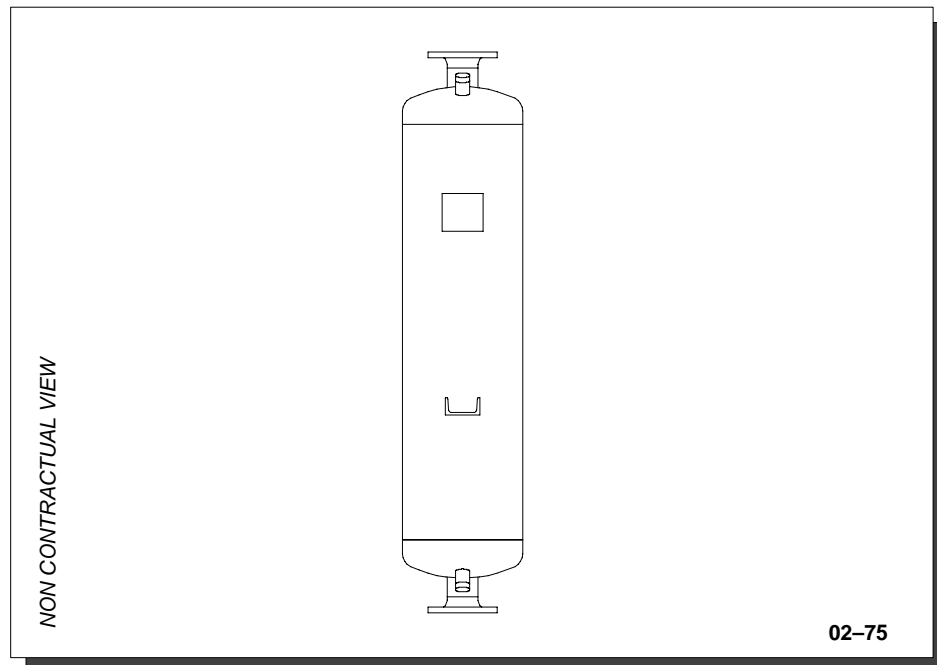
Les seules pièces de rechange nécessaires à l'exploitation du séparateur dévésiculeur de la **série K**, en dehors des pièces de rechange nécessaires à l'entretien de la purge automatique

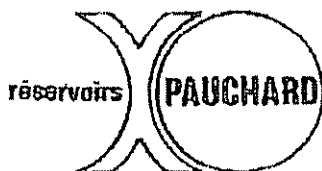
sont le joint supérieur du séparateur et le tampon métallique. Voir le tableau « Pièces détachées » en partie 5 du dossier pour plus d'informations.

The only spare parts you need to maintain this separator, excepted for the automatic drain, are gasket and coalescer element. You will find information to order them in « Spare parts » table, part 5 of this dossier.

6.17 MANUAL FOR THE TANKS (PAUCHARD)

Location	Reference
Air drying by adsorption	02-75





INSTRUCTIONS

for tanks subjected to 87/404/EEC directive of the 25th June 1987
and to executive order of 14th December 1989.

Manufacturer : RESERVOIRS X PAUCHARD
71402 AUTUN
FRANCE

Type : 02-75

Operating conditions

Maximum working pressure P.S.	: 10,5 bars
Minimum working temperature T min	: -10 °C
Maximum working temperature T max	: 100°C
Internal volume or capacity	: 130 litres

Scope of use

Pressure tank intended for holding air or nitrogen within the limits of the operating conditions specified above.
Pressure variations and their frequency must remain within the limits of normal operating conditions.

Installation and maintenance conditions

The tank must be installed in a neutral, normal and standard atmosphere in areas that do not risk causing variations in the overall temperature of the device exceeding working temperature limits; it must be connected to ground. It must be drained every days or after each use.
As incidents may occur (valve opening, gate or pipe leakage, etc.), it is preferable to avoid installing the device in a frequented area, or near fragile equipment.

It must have easy access for standard checks.

A manometer must be connected and provided with an isolating valve gate to the tank so as to check the inside pressure. The maximum working pressure (10.5 bars) must be indicated with a red line on the manometer itself.

The user should ensure a safety device is directly connected to the tank, protecting it from excess pressure.

This safety device or valve must be adjusted so that it is triggered off as soon as the maximum working pressure of the tank is exceeded, considering a certain amount of tolerance due to the relative inaccuracy of the different regulation devices.

Tanks are delivered with or without corrosion protection (Hot galva, internal paint, external paint). It is therefore the user's responsibility to ensure such protection is provided. If in doubt, ask the manufacturer and indicate the particular condition of setting and use.

It is recommended to provide protection for the outer part of tanks to limit any risk of damage.

In order to limit corrosion risk, it is advised to use air as dry as possible and take care of regularly draining.

In order to check its inner state, the tank must be inspected on a regular basis in accordance with the rules and regulations in force in the country in which the tank has been installed.

After inspection, the user must ensure that **the two DN80 flanges are carefully replaced on each of the heads.**

Regular thickness checks should also be carried out using appropriate means (ultrasound, magnetic devices, etc.). The measured thickness should in no case be less than 2.0 mm for the cylindrical part and 2.5 mm for tank bottoms.

As vibratory action may cause damage to the tank, it is important to ensure all necessary connection and installation measures have been taken to avoid it being affected by such phenomena.

The tanks must be fitted and clamped in such a way that constraint and tension are avoided, and all vibrations, including those which are not apparent, are absorbed.

The tank base must be able to support the weight of the tank, even during re-testing.

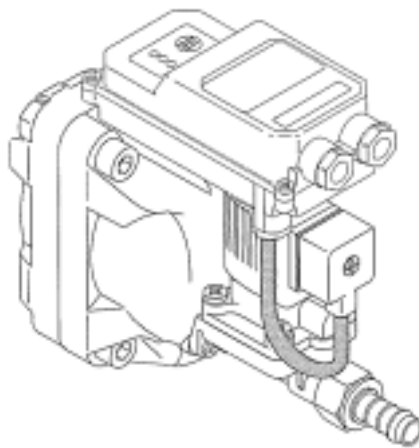
In addition to the instructions mentioned above, the user must comply with the legislation in force in the country of use for routine checks, inspection and re-testing.

Tank modification or repair is not permitted without prior manufacturer authorisation.

6.18 CONDENSATION CAPACITIVE DRAIN 13 CO PN 25 (BEKOMAT)

Location	Reference
SEPARATOR	BEKOMAT 13 CO PN25

NON CONTRACTUAL VIEW



BEKOMAT

Installations- und Betriebsanleitung

deutsch

Instructions for installation and operation

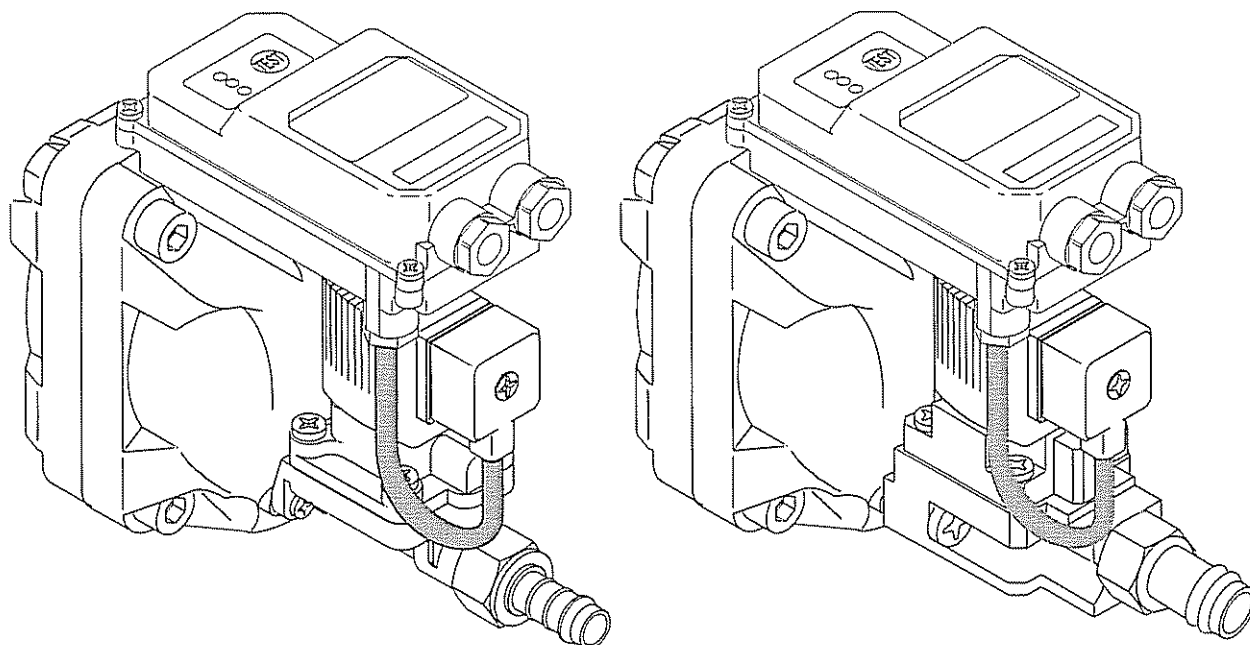
english

Instructions de montage et de service

français

Installatie- en Gebruiksaanwijzing

nederlands



BEKOMAT® 13
BEKOMAT® 13 CO
BEKOMAT® 13 CO PN25
BEKOMAT® 13 CO PN40

Sehr geehrter Kunde,
vielen Dank, daß Sie sich für den Kondensatableiter BEKOMAT entschieden haben. Bitte lesen Sie vor Montage und Inbetriebnahme des BEKOMAT diese Installations- und Betriebsanleitung aufmerksam und befolgen Sie unsere Hinweise. Nur bei genauer Beachtung der beschriebenen Vorschriften und Hinweise ist die einwandfreie Funktion des BEKOMAT und damit eine zuverlässige Kondensatableitung sichergestellt.

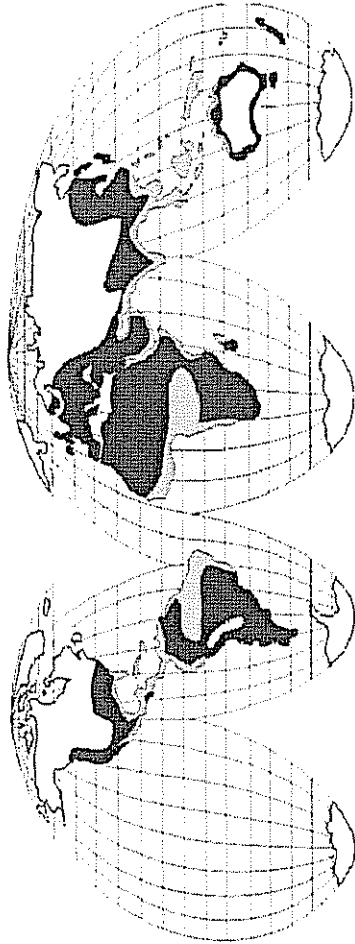
Dear Customer,
Thank you for deciding in favour of the condensate drain BEKOMAT. Please read the present instructions carefully before installing your BEKOMAT unit and putting it into service. The perfect functioning of the condensate drain BEKOMAT - and thus reliable condensate discharge - can only be guaranteed if the recommendations and conditions stated here are adhered to.

Cher client,
Vous venez d'acquérir un purgeur de condensat BEKOMAT et nous vous en félicitons. Nous vous recommandons de lire attentivement ces instructions avant le montage et la mise en service du BEKOMAT et de suivre nos conseils. Car, seul le respect scrupuleux des prescriptions et consignes données, peut garantir le parfait fonctionnement du BEKOMAT et une purge fiable du condensat.

Geachte klant,
Wij danken u voor het aanschaffen van de kondensaatafvoer BEKOMAT. Wij verzoeken u voor installatie en ingebruikname van de BEKOMAT eerst deze handleiding goed door te lezen. Alleen door het opvolgen van de voor-schriften is een goede werking van de BEKOMAT en daardoor een ongestoorde kondensaatafvoer gegarandeert.

Technische Daten • Technical Data Characteristiques Techniques • Technische Gegevens					
BEKOMAT					
	13	13 CO	13 CO PN25	13 CO PN40	
min./max. Temperatur min/max. temperature Température min/max Min./max. temperatuur				+1/+60 °C	
Kondensatzulaut Condensate lead Entrée du condensat Kondensaalinvoer		2 x G½			
Kondensatlauff (Schlauch) Condensate discharge (hose) Sortie du condensat (flexible) Kondensaallvoer (slang)	G½ - a (di = 13 mm)				G 3/8" - i
max. Kompressorleistung peak compressor performance Capacité maximale du compresseur Max. compressorcapaciteit		30 m³/min			
max. Kältefrosterleistung (nur mit Vorabscheidung) peak refrigeration dryer performance (only with pre-separation) Capacité max. du sécheur frigo (seules avec pré-séparation) Max. koeldrogercapaciteit (alleen met voorabscheiding)		60 m³/min			
max. Filterleistung (hinter Trockner) peak filter performance (behind dryer) Capacité maximale filtre (derrière sécheur) Max. filtercapaciteit (achter koeldroger)		300 m³/min			siehe Seite 4+5 / zie blz. 4+5 voir page 4+5 / see page 4+5
min./max. Betriebsdruck operating pressure, min/max Pression de service min/max Min./max. bedrijfsdruk		0,8...16 bar	0,8...25 bar	0,8...40 bar	
Gewicht (leer) weight (empty) Poids (à vide) Gewicht (leeg)			2,0 kg		
Kondensat condensate Condensat Kondensaat	ölhaltig oil-contaminated huileux oliehoudend	ölhaltig + ölfrei oil-contaminated + oil-free huileux + non huileux oliehoudend + olie vrij			
Gehäuse housing Boîtier Behuizing	Aluminium Aluminium Aluminium Aluminium	Aluminium, hartcoatiert Aluminium, hard-coated Aluminium, avec protection anticorrosive Aluminium, hardgecoat			

deutsch	english	français	nederlands
Sicherheitshinweise Bitte prüfen, ob die Anleitung auch dem BEKOMAT Typ entspricht. 1. Max. Betriebsdruck nicht überschreiten (siehe Typenschild)! ACHTUNG! Wartungsarbeiten nur im drucklosen Zustand durchführen! 2. Nur Druckfestes Installationsmaterial verwenden! Zulaufleitung (½") fest verrohren. Ablaufleitung: kurzer Druckschlauch an druckfestes Rohr. Verhindern Sie, dass Personen oder Gegenstände von Kondensat getroffen werden können. 3. Werden am Zulauf konische Verschraubungen verwendet, übermäßige Anzugskräfte vermeiden. 4. Bei Montage Schlässelfläche (SW32) am Zulauf zum Gegenhalten bzw. Kontern benutzen! 5. Bei elektrischer Installation alle geltenden Vorschriften einhalten (VDE 0100)! ACHTUNG! Wartungsarbeiten nur um spannungsfreien Zustand durchführen! Alle elektrischen Arbeiten dürfen nur von begl. Fachpersonal durchgeführt werden. 6. Bei Frostgefahr thermostatische Heizung nachrüsten (Zubehör). 7. BEKOMAT ist nur bei anliegender Spannung funktionstüchtig. 8. Test-Taster nicht zur Dauerentwässerung nutzen. 9. BEKOMAT nicht in explosionsgefährdeten Bereichen einsetzen. 10. Nur Original-Ersatzteile verwenden. Andernfalls erlischt die Garantie.	Safety rules Please check if the manual is the same as the type of BEKOMAT. 1. Do not exceed max. operating pressure (see type plate)! NOTE: Maintenance work must only be carried out when the device is not under pressure! 2. Only use pressure-proof installation material! The lead line (½") must be firmly fixed. Discharge line: short pressure hose to pressure-proof pipe. Please ensure that condensate cannot squirt onto persons or objects. 3. In case conical connectors are used on the inlet side, avoid excessive tightening of the connectors. 4. For locking or holding in position during installation, use spanner area at inflow point (spanner size 32)! 5. The electrical installation must be carried out in compliance with the valid regulations! NOTE: Maintenance work is only allowed when the device is in a de-energized condition! Electrical work must always be performed by a qualified electrician. 6. In areas where there is a danger of frost, the device should be retrofitted with thermostatically controlled heating (accessories). 7. The BEKOMAT condensate drain will only function when voltage is being applied to the device. 8. Do not use the test button for continuous draining. 9. Do not use the BEKOMAT device in hazardous areas (with potentially explosive atmospheres). 10. Only employ original spare parts, otherwise the guarantee will no longer be valid.	Consignes de sécurité Vérifiez que la notice correspond bien au modèle de BEKOMAT. 1. Ne pas dépasser la pression de service de 16 bars (voir plaque signalétique)! ATTENTION ! Dépressuriser le purgeur avant toute intervention d'entretien! 2. N'utiliser que du matériel d'installation résistant à la pression! Conduite d'arrivée: toujours en tuyauterie rigide et fixe (½"). Conduite d'évacuation: flexible de faible longueur relié à un tube, tous deux résistant à la pression. Évitez que des personnes ou objets puissent être touchés par le condensat. 3. Ne pas utiliser de raccords à filetage conique! 4. Lors du montage, utiliser le méplat pour clé de 32 mm situé à l'entrée du purgeur! 5. Lors de l'installation électrique, respecter toutes les prescriptions en vigueur (VDE 0100)! ATTENTION ! Avant toute intervention de maintenance, mettre l'installation hors tension! Toute intervention électrique doit être réalisée exclusivement par un personnel qualifié et autorisé. 6. En cas de risque de gel, rajouter un chauffage thermostatique (accessoires). 7. Le BEKOMAT n'est opérationnel que s'il est sous tension. 8. Ne pas utiliser la touche Test pour une purge permanente. 9. Ne pas utiliser le BEKOMAT dans les atmosphères explosives. 10. Utiliser exclusivement des pièces de rechange d'origine. Dans le cas contraire, la garantie est annulée.	Veiligheidsvoorschriften Gelieve te controleren of deze handleiding ook overeenstemt met het BEKOMAT-type. 1. Max. bedrijfsdruk niet overschrijden (zie typeplaatje)! PAS OPI! Onderhoudswerkzaamheden uitsluitend uitvoeren in drukloze toestand. 2. Alleen drukbestendig installatiemateriaal gebruiken! Voor de toevoerleiding een pijp (½"), voor de afvoerleiding een hogedruk-slang gebruiken (slangmaat di = 13 mm). Pas op, dat personen en voorwerpen niet door het condensaat geraakt worden. 3. Wanneer conische verbindingen worden gebruikt mogen deze niet te krachtig worden aangedraaid om beschadigingen te voorkomen aan de kondensaalinvoer. 4. Bij montage van de toevoerleiding het aansluitstuk vasthouden met sleutelmaat (SW32). 5. De elektrische installatie alleen uitvoeren volgens de geldende voorschriften! PAS OPI! Onderhoudswerkzaamheden alleen uitvoeren in spanningsloze toestand. Werkzaamheden mogen alleen worden uitgevoerd door daartoe bevoegd personeel. 6. Bij voorstel van de thermostatisch geregelde verwarming (optie) installeren. 7. De BEKOMAT functioneert alleen bij ingeschakelde netspanning. 8. De testschakelaar niet voor continue drainage gebruiken. 9. De BEKOMAT niet in explosiegevaarlijke ruimten gebruiken. 10. Gebruik bij onderhoud alleen originele onderdelen, daar anders de garantie opgevoerd wordt.



Klimazona Climatic zone Zone climatique Klimaatzone	Max. Kompressorleistung Peak compressor performance Capacité max. du compresseur Max. compressor capaciteit	Max. Trocknerleistung Peak dryer performance Capacité max. du sécheur Max. kooldroger capaciteit	Max. Filterleistung Peak filter performance Capacité max. du filtre Max. filtercapaciteit	
BEKOMAT 21	grün/green/vert/groen	5,0	10,0	50,0
	blau/blue/bleu/blauw	4,0	8,0	40,0
	rot/red/rouge/rood	2,5	5,0	25,0
BEKOMAT 12	grün/green/vert/groen	8,0	16,0	80,0
	blau/blue/bleu/blauw	6,5	13,0	65,0
	rot/red/rouge/rood	4,0	8,0	40,0
BEKOMAT 13	grün/green/vert/groen	35,0	70,0	350,0
	blau/blue/bleu/blauw	30,0	60,0	300,0
	rot/red/rouge/rood	20,0	40,0	200,0
BEKOMAT 14	grün/green/vert/groen	150,0	300,0	1500,0
	blau/blue/bleu/blauw	130,0	260,0	1300,0
	rot/red/rouge/rood	90,0	180,0	900,0
BEKOMAT 16	grün/green/vert/groen	1700,0	3400,0	
	blau/blue/bleu/blauw	1400,0	2800,0	
	rot/red/rouge/rood	1000,0	2000,0	

Auskünfte zu den Klimazonen geben weltweit unsere Vertriebspartner, Niederlassungen, BEKO Deutschland oder schauen Sie auf unsere Homepage www.beko.de.

If you need further information about the three BEKO climate zones, contact your local BEKO dealer, BEKO subsidiary, BEKO Germany or look into our website at www.beko.de

Pour de renseignements supplémentaires veuillez nous contacter www.beko.de

Voor verdere detail gegevens zie onze site www.beko.nl of bel +31 165 320300.

Leistungs tests und unsere jahrelange Markterfahrung ermöglichen uns eine neue Leistungsanordnung der BEKOMAT. Die Berücksichtigung von weltweiten Klimazonen bewirkt Verbesserungen der jeweiligen Auslegungsdaten

Die angegebenen Leistungsdaten beziehen sich auf gemäßigtes Klima mit Gültigkeit für Europa, weite Teile Süd-Ost-Asiens, Nord- und Südafrika, Teile Nord- und Südamerikas (Klimazone: Blau).

Für trockenes und/oder kühles Klima (Klimazone: Grün) gilt folgender Faktor:

Leistung in Klimazone "Blau" ca. x 1,2

Für warmes und/oder feuchtes Klima (Tropen; Klimazone: Rot) gilt folgender Faktor:

Leistung in Klimazone "Blau" ca. x 0,7

Capacity tests and our long market experience have given us the opportunity to realign our capacity figures for BEKOMAT. In addition to the known capacity data, we considered world climate data and incorporated these into the capacity figures.

The compressor capacity figures relate to mild climate valid for Europe, large parts of South-East Asia, Northern Africa, parts of North- and South America (climate zone: Blue)

For dry and/or cold climate (climate zone: Green),

multiply the Blue zone figure with the following correction factor: approx. 1,2

For warm and/or wet climate (climate zone: Red),

multiply the Blue zone figure with the following correction factor: approx. 0,7

Les capacités indiquées se rapportent à un climat tempéré, valable pour l'Europe, certaines parties du Sud-Est asiatique, l'Afrique du Nord et du Sud, certaines parties de l'Amérique du Nord et du Sud (zone climatique: bleu).

Pour un climat sec et/ou frais (zone climatique: vert), il convient d'appliquer le facteur suivant :

Capacité en zone climatique "bleu" environ x 1,2

Pour un climat chaud et/ou humide (zones tropicales; zone climatique: rouge), il convient d'appliquer le facteur suivant:

Capacité en zone climatique "bleu" environ x 0,7

Door wereldwijd langdurige praktijkervaring met de BEKOMAT in verschillende klimaatzones, kunnen we nu nog nauwkeuriger het juiste type, BEKOMAT selecteren.

Een correct type BEKOMAT kiest u door eerst de klimaatzone te selecteren waar de installatie wordt opgesteld.

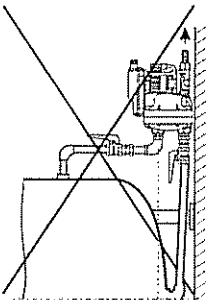
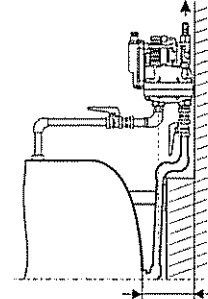
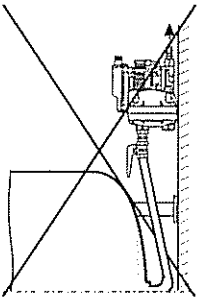
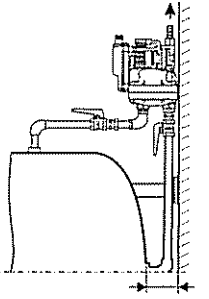
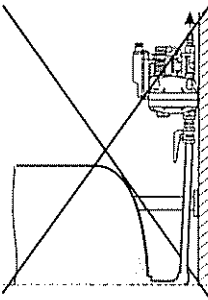
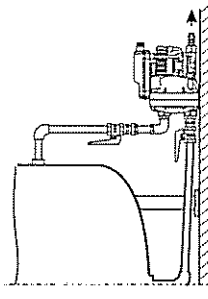
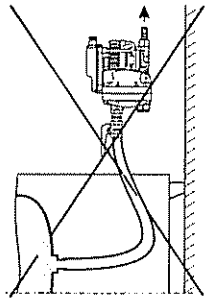
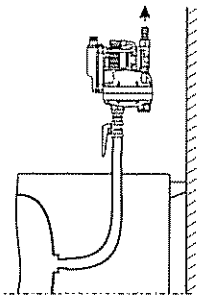
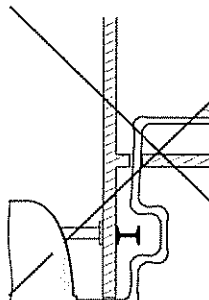
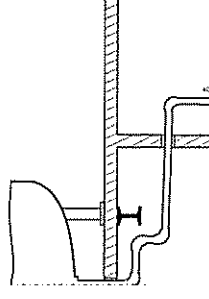
Groen is een droog en koel klimaat b.v. Noord Europa, Canada, Noord Amerika, centraal Azië.

Blauw is een gematigd klimaat b.v. midden en zuid Europa, midden Amerika.

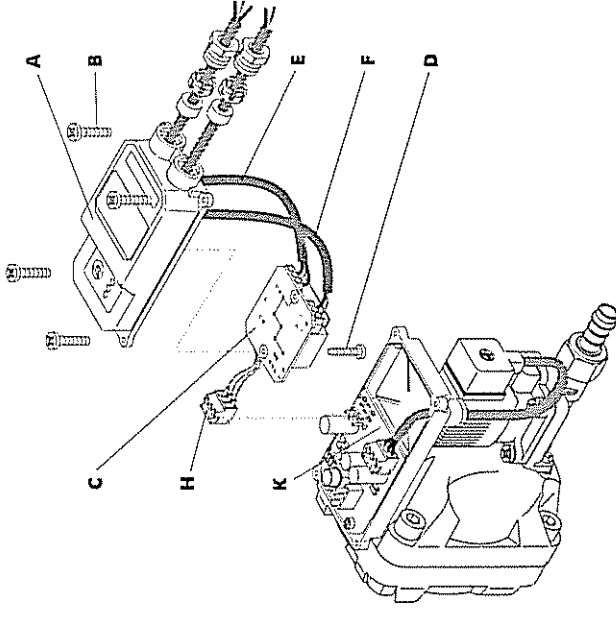
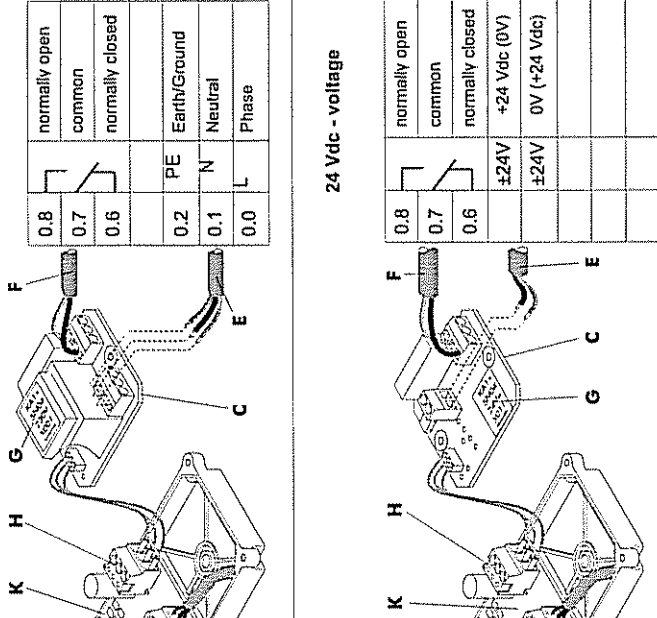
Rood is een tropen klimaat b.v. Zuid Oost Aziatische kustgebieden, Amazone en de Kongo.

Installation • Installation Installation • Installatie		uitsch
	richtig • correct correct • juist	1. Zulaufrohr und Filling mind. 1/2" (Innendurchmesser ≥ 13 mm) 2. Keine Filter im Zulauf! 3. Gefälle im Zulauf > 1% ! 4. Nur Kugelventile verwenden! 5. Druck: mind. 0,8 bzw. 1,2 bar! (Druck auf Typenschild ablesen) 6. Kurzer Druckschlauch! 7. Pro Meter Steigung in der Ablaufleitung, erhöht sich der erforderliche Mindestdruck um 0,1 bar! 8. Ablaufleitung max. 5 m steigend! 9. Sammelleitung mind. 3/4" mit 1% Gefälle verlegen! 9. Bei Zulaufproblemen Entlüftungsleitung installieren.
		Beachte: Druckdifferenzen! Jede Kondensatanfallstelle muss separat entwässert werden!
	falsch • wrong incorrect • onjuist	Beachte: Entlüftung! Bei nicht ausreichendem Gefälle im Zulauf oder anderen Zulaufproblemen muß eine Luftausgleichsleitung verlegt werden!
		Beachte: Prallfläche! Soll aus der Leitung direkt entwässert werden, ist eine Umlenkung des Luftstromes sinnvoll!

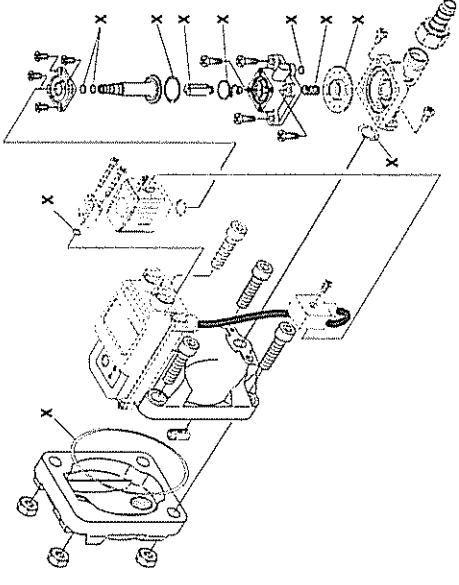
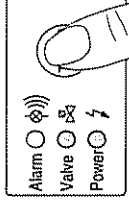
engl	français	ned
1. Feed pipe and filling at least 1/2" (inner diameter ≥ 13 mm) 2. No filters in feed line 3. Slope in feed line > 1%! 4. Only use ball valves! 5. Pressure: min. 0.8 bar or 1.2 bar! (check type plate for correct pressure) 6. Short pressure hose! 7. For each metre of rising slope in the outlet line, the required minimum pressure will increase by 0.1 bar. The rise of the outlet line must not exceed 5 metres! 8. Collecting line min. 3/4" with 1% slope 9. In the case of inflow problems, install venting line.	1. Tube d'amenée, au moins 1/2" (Diamètre intérieur ≥ 13 mm) 2. Pas de filtre sur l'amenée ! 3. Pente de l'amenée > 1% ! 4. Utiliser uniquement des vannes à boisseau sphérique ! 5. Pression : minimum 0,8 ou 1,2 bar! (relevier la pression sur la plaque) 6. Flexible pression de faible longueur! 7. Pour chaque mètre de pente montante sur la conduite d'évacuation, il faut augmenter la pression minimale requise de 0,1 bar! Evacuation: longueur max. de la partie montante : 5 m ! 8. Conduite collectrice : au minimum 3/4" avec 1% de pente 9. La conduite d'écoulement doit être raccordée par un col de cygne sur la conduite collectrice	1. Toevoerleiding en filling minstens 1/2"! (Dootlaat diameter ≥ 13 mm) 2. Geen filter in toevoerleiding monteren! 3. Toevoerleiding met verval monteren > 1%! 4. Alleen kogelsluiters gebruiken! 5. Druk: minimaal 0,8 resp. 1,2 bar! 6. Korte hogedrukslang! 7. Per meter stijging in de afvoerleiding wordt de noodzakelijke minimumdruk verhoogd met 0,1 bar! 8. Afvoerleiding max. 5 m omhoog-voeren! 9. Verzamelleiding minimaal 3/4" met minimaal 1% verval aanleggen 9. Bij problemen met aanvoer drukverlating installeren.
Note: Pressure differences! Each condensate source must be drained separately!	Important : différences de pression ! Chaque point de souillage de condensat doit être purgé individuellement pour éviter le by-pass. Une purge continue ne serait plus possible dans ces conditions !	Belangrijk: Let op drukverschillen! Ieder afvoerpunt apart draineren. Het drukverschil tussen de afvoerpunten zorgt in de condensaatafvoerleiding voor een by-pass stroming.
Note: Venting! If the feed line cannot be laid with sufficient slope or if there are other inflow problems, it will be necessary to install a venting line!	Important : équilibrage d'air ! Si la pente de l'amenée n'est pas suffisante, il faut poser une conduite d'équilibrage d'air !	Belangrijk: Ontluchten! Indien de toevoerleiding niet op afschot is gemoniseerd of andere aanvoerproblemen, moet voor de toevoer een aparte ontluchtingsleiding worden geïnstalleerd.
Note: Deflector area! If drainage is to take place directly from a line, it is advisable to arrange the piping so that the air flow is diverted.	Important : chicane ! Si la purge doit s'effectuer directement sur la tuyauterie, il faut prévoir une chicane pour que le condensat ne soit pas entraîné par le débit d'air comprimé !	Belangrijk: Diepste punt! Bij directe drainage in het leiding-systeem moet de BEKOMAT altijd op het diepste punt geïnstalleerd worden. Wij adviseren hiervoor een broekstuk te gebruiken.

Installation • Installation Installation • Installatie		tsch	
falsch • wrong Incorrect • onjuist	richtig • correct correct • juist		
		Beachte: Mindest-Einbauhöhe Die Zulaufhöhe muß unterhalb der tiefsten Stelle des Sammelraumes (z.B. Kessel) liegen.	
		Beachte: Kontinuierliches Gefälle Die Zulaufhöhe stets mit kontinuierlichem Gefälle verlegen. Bei beschränkter Einbauhöhe unteren Zulauf mit separater Entlüftungsleitung installieren.	
		Beachte: Entlüftungsleitung Bei hohem Kondensalanfall muß stets eine separate Entlüftungsleitung installiert werden.	
		Beachte: kontinuierliches Gefälle! Wird ein Druckschlauch als Zulauf verwendet, Wassersack vermeiden!	
		Beachte: kontinuierliches Gefälle! Auch bei Verrohrung der Zulaufleitung, Wassersack vermeiden.	













englis.	français	nedr ds
Note: Minimum height of installation The inflow point must be located lower than the lowest point of the collecting tank or vessel.	Important : hauteur minimale de montage La hauteur d'arrivée doit être située en dessous du point le plus bas du collecteur (par exemple, la cuve)	Belangrijk: Minimale inbouwhoogte! De toevvoerhoogte dient altijd onder het aflooppunt van de verzamelruimte te liggen (b.v. ketel).
Note: Continuous slope The feed line must always be laid with a continuous downward slope. If the space for installation is too restricted, the lower feed line must be provided with a separate venting line.	Important: pente continue La conduite d'arrivée doit toujours être réalisée avec une pente continue. En cas de hauteur de montage limitée, utiliser l'entrée du bas et réaliser une conduite séparée d'équilibrage d'air.	Belangrijk: Continue vervall Het condensaat moet altijd met verval (min. 1%) toestromen. Ingeval van een beperkte inbouwhoogte dient een aparte ontluchtingsleiding te worden geïnstalleerd.
Note: Venting line In the case of large condensate quantities, it will always be necessary to install a separate venting line.	Important: conduite d'équilibrage d'air En cas de forte production de condensat, il faut toujours installer une conduite séparée d'équilibrage d'air.	Belangrijk: Ontluchtingsleiding Bij grote condensaathoeveelheden dient altijd een aparte ontluchtings-leiding te worden geïnstalleerd.
Note: Continuous slope It is important to avoid water pockets when using a pressure hose as a feed line!	Important : pente continue ! Si l'amenée est réalisée au moyen d'un tuyau flexible, il faut éviter toute "retenue d'eau" !	Belangrijk: Op afschot monteren! Wanneer een slang als toevvoerleiding gebruikt wordt, mag er n geen geval een waterslot ontstaan!
Note: Continuous slope! Water pockets must also be avoided when laying a feed pipe.	Important : pente continue ! Si l'amenée est réalisée au moyen d'une tuyauterie rigide, il faut aussi éviter toute "retenue d'eau" !	Belangrijk: Continue vervall Ook bij het aanleggen van de afvoerleiding een waterslot vermijden.

Elektrische Installation • Electrical installation • Installation électrique • Elektrische installatie	Deutsch																						
	<ul style="list-style-type: none"> • Haubendeckel (A) nach Lösen der 4 Schrauben (B) demontieren • Netzteileplatine (C) aus Haubendeckel (A) nach Lösen der Schraube (D) herausnehmen • Kabel für Spannungsversorgung (E) und potentialfreien Kontakt (F) durch Kabelverschraubungen führen • Klemmenbelegung <p>Zulässige Netzspannung unbedingt auf Typenschild (G) ablesen!</p> <p>Vac Spannungsversorgung</p> <table border="1"> <tr> <td>0.0 L</td> <td>0.0 L</td> </tr> <tr> <td>0.1 N</td> <td>0.1 N</td> </tr> <tr> <td>0.2 PE</td> <td>0.2 PE</td> </tr> </table> <p>24 Vdc Spannungsversorgung</p> <table border="1"> <tr> <td>+24 Vdc (0V)</td> <td>+24 Vdc (0V)</td> </tr> <tr> <td>0V (+24 Vdc)</td> <td>0V (+24 Vdc)</td> </tr> </table> <p>Bei 24 Vdc-Betrieb darf nicht Masse auf + (plus) 24 Vdc gelegt werden, da geräteeigen Minus auf Gehäusepotential liegt.</p> <ul style="list-style-type: none"> • Potentialfreien Kontakt (F) an Klemmen 0.6 - 0.7 (bei Störung geschlossen) oder 0.7 - 0.8 (bei Störung geöffnet) anschließen • Kabel (E + F) straffen und Kabelverschraubungen festschrauben • Netzteileplatine (C) im Haubendeckel (A) mit Schraube (D) befestigen • Kabelstecker (H) auf Steuerplatine (K) aufstecken • falls irrtümlich die Einzelkabel aus dem Kabelstecker geschraubt wurden, gilt folgende Zuordnung: 1.0 = braun 1.1 = blau 2.0 = schwarz • Haubendeckel (A) aufsetzen und die 4 Schrauben (B) anziehen <p>Beachten!</p> <p>Netzteileplatine (C) sitzt gedreht (über Kopf) im Haubendeckel (A).</p> <p>Im lastfreien Betrieb kann an den Klemmen 1.0 und 1.1 (Kabelstecker (H)) eine Spannung von bis zu 36 Vdc gemessen werden.</p> <p>Installationsarbeiten gemäß VDE 0100 ausführen.</p>	0.0 L	0.0 L	0.1 N	0.1 N	0.2 PE	0.2 PE	+24 Vdc (0V)	+24 Vdc (0V)	0V (+24 Vdc)	0V (+24 Vdc)												
0.0 L	0.0 L																						
0.1 N	0.1 N																						
0.2 PE	0.2 PE																						
+24 Vdc (0V)	+24 Vdc (0V)																						
0V (+24 Vdc)	0V (+24 Vdc)																						
	<p>Vac - voltages</p> <table border="1"> <tr> <td>0.8</td> <td>normally open</td> </tr> <tr> <td>0.7</td> <td>common</td> </tr> <tr> <td>0.6</td> <td>normally closed</td> </tr> <tr> <td>0.2</td> <td>PE</td> </tr> <tr> <td>0.1</td> <td>N</td> </tr> <tr> <td>0.0</td> <td>L</td> </tr> </table> <p>24 Vdc - voltage</p> <table border="1"> <tr> <td>0.8</td> <td>normally open</td> </tr> <tr> <td>0.7</td> <td>common</td> </tr> <tr> <td>0.6</td> <td>normally closed</td> </tr> <tr> <td>±24V</td> <td>+24 Vdc (0V)</td> </tr> <tr> <td>±24V</td> <td>0V (+24 Vdc)</td> </tr> </table> 	0.8	normally open	0.7	common	0.6	normally closed	0.2	PE	0.1	N	0.0	L	0.8	normally open	0.7	common	0.6	normally closed	±24V	+24 Vdc (0V)	±24V	0V (+24 Vdc)
0.8	normally open																						
0.7	common																						
0.6	normally closed																						
0.2	PE																						
0.1	N																						
0.0	L																						
0.8	normally open																						
0.7	common																						
0.6	normally closed																						
±24V	+24 Vdc (0V)																						
±24V	0V (+24 Vdc)																						

engl	français	nederlands																														
<ul style="list-style-type: none">• Lift off domed cover (A) after removing the 4 screws (B).• Take power supply board (C) out of the domed cover (A) after removing the screw (D).• Guide cables for power supply (E) and potential-free contact (F) through screwed cable fittings.• Terminals <p>Check type plate (G) for permissible mains voltage and ensure conformity!</p> <p>Vac power supply</p> <table><tr><td>0.0 L</td><td>0.0 L</td></tr><tr><td>0.1 N</td><td>0.1 N</td></tr><tr><td>0.2 PE</td><td>0.2 PE</td></tr></table> <p>24 Vdc power supply</p> <table><tr><td>+24 Vdc (0V)</td><td>+24 Vdc (0V)</td></tr><tr><td>0V (+24 Vdc)</td><td>0V (+24 Vdc)</td></tr></table> <p>In the case of 24 Vdc operation, do not connect +24 Vdc to frame because the internal housing potential of the device is negative.</p> <ul style="list-style-type: none">• Connect potential-free contact (F) to terminals 0.6 - 0.7 (fail safe) or 0.7 - 0.8 (open during malfunction).• Pull cable (E + F) tight and screw down cable fittings.• Screw power supply board (G) with screw (D) into domed cover (A).• Plug ribbon cable (H) into control PCB (K).• If the individual wires have not been screwed into the plug, they should be attached as follows: 1.0 = brown 1.1 = blue 2.0 = black• Put on top of cover (A) and tighten the 4 screws (B) <p>Please note:</p> <p>The power supply board (C) is in a reverse position (upside down) in the domed cover (A).</p> <p>During no-load operation, a voltage of up to 36 Vdc may be measured at terminals 1.0 and 1.1 (plug ribbon cable (H)).</p> <p>Please ensure that the installation is carried out according to the valid regulations.</p>	0.0 L	0.0 L	0.1 N	0.1 N	0.2 PE	0.2 PE	+24 Vdc (0V)	+24 Vdc (0V)	0V (+24 Vdc)	0V (+24 Vdc)	<ul style="list-style-type: none">• Démontez le capot (A), après avoir dévissé les 4 vis (B)• Retirer la carte d'alimentation (C) du capot (A), après avoir dévissé la vis (D)• Enfiler à travers les presse-étoupes, les câbles pour l'alimentation électrique (E) et le contact sans potentiel (F)• Bornes <p>Respecter impérativement la tension secteur admissible, mentionnée sur la plaque signalétique (G) !</p> <p>Vac Alimentation électrique</p> <table><tr><td>0.0 L</td><td>0.0 L</td></tr><tr><td>0.1 N</td><td>0.1 N</td></tr><tr><td>0.2 PE</td><td>0.2 PE</td></tr></table> <p>24 Vdc Alimentation électrique</p> <table><tr><td>+24 Vdc (0V)</td><td>+24 Vdc (0V)</td></tr><tr><td>0V (+24 Vdc)</td><td>0V (+24 Vdc)</td></tr></table> <p>En cas d'alimentation 24 Vdc, la masse ne doit pas être reliée au +24Vdc étant donné qu'à l'intérieur de l'appareil le moins est au potentiel du boîtier.</p> <ul style="list-style-type: none">• Raccorder le contact sans potentiel (F) aux bornes 0.6 - 0.7 (fermé en cas de panne) ou 0.7 - 0.8 (ouvert en cas de panne)• Tendre les câbles (E + F), puis serrer les presse-étoupes• Revisser la carte d'alimentation (C) avec la vis (D) dans le capot (A)• Enfiler le câble en nappe (connecteur (H)) sur la carte de commande (K)• Au cas où les différents fils seraient par inadvertance dissociés de la fiche, respecter la répartition suivante: 1.0 = marron 1.1 = bleu 2.0 = noir• Mettre le capot (A) en place et visser les 4 vis (B) <p>Important !</p> <p>La carte d'alimentation (C) est à l'envers dans le capot (A).</p> <p>A vide, on peut relever aux bornes 1.0 et 1.1 (câble en nappe connecteur (H)) une tension pouvant atteindre 36 Vdc.</p> <p>Exécuter les travaux d'installation conformément à VDE 0100.</p>	0.0 L	0.0 L	0.1 N	0.1 N	0.2 PE	0.2 PE	+24 Vdc (0V)	+24 Vdc (0V)	0V (+24 Vdc)	0V (+24 Vdc)	<ul style="list-style-type: none">• Bovendeksel (A) demonteren door losdraaien van 4 schroeven (B).• Voedingssprint (C) losschroeven en uit de bovendeksel (A) halen.• Voedingskabel (E) en kabel voor potentiaalvrij contact (F) door wartels en bestemde gaten doorvoeren.• Contacten <p>Controleer altijd de toegestane netspanning op het typeplaatje (G)!</p> <p>Vac voedingskabel</p> <table><tr><td>0.0 L</td><td>0.0 L</td></tr><tr><td>0.1 N</td><td>0.1 N</td></tr><tr><td>0.2 PE</td><td>0.2 PE</td></tr></table> <p>24 Vdc voedingskabel</p> <table><tr><td>+24 Vdc (0V)</td><td>+24 Vdc (0V)</td></tr><tr><td>0V (+24 Vdc)</td><td>0V (+24 Vdc)</td></tr></table> <p>Bij 24 Vdc weking mag massa niet op +24 Vdc worden gelid, omdat intern in het apparaat minus op het omhulingspotentiaal ligt.</p> <ul style="list-style-type: none">• Potentiaalvrij contact (F) op contacten 0.6 - 0.7 (bij storing gesloten) of 0.7 - 0.8 (bij storing geopend) aansluiten.• Kabels (E + F) aantrekken en wartels vastdraaien.• Voedingssprint (C) vastschroeven in bovendeksel (A).• Flatcable (stekker) (H) op besturingsprint (K) steken.• Als de eenstrengkabels per ongeluk uit de kabelstecker zijn geschroefd, geldt de volgende toewijzing: 1.0 = bruin 1.1 = blauw 2.0 = zwart• Bovendeksel (A) opzetten en met de 4 schroeven (B) vastdraaien. <p>Belangrijk!</p> <p>De voedingssprint (C) zit gedraaid (ondersteboven) in de bovendeksel (A).</p> <p>In onbelaste toestand kan een spanning van 36 Vdc worden gemeten op contact 1.0 en 1.1 (flatcable stekker (H)).</p> <p>Installatiewerkzaamheden altijd volgens de geldende voorschriften uitvoeren.</p>	0.0 L	0.0 L	0.1 N	0.1 N	0.2 PE	0.2 PE	+24 Vdc (0V)	+24 Vdc (0V)	0V (+24 Vdc)	0V (+24 Vdc)
0.0 L	0.0 L																															
0.1 N	0.1 N																															
0.2 PE	0.2 PE																															
+24 Vdc (0V)	+24 Vdc (0V)																															
0V (+24 Vdc)	0V (+24 Vdc)																															
0.0 L	0.0 L																															
0.1 N	0.1 N																															
0.2 PE	0.2 PE																															
+24 Vdc (0V)	+24 Vdc (0V)																															
0V (+24 Vdc)	0V (+24 Vdc)																															
0.0 L	0.0 L																															
0.1 N	0.1 N																															
0.2 PE	0.2 PE																															
+24 Vdc (0V)	+24 Vdc (0V)																															
0V (+24 Vdc)	0V (+24 Vdc)																															

Elektrische Daten • Electrical data Caractéristiques électriques • Elektrische gegevens				sch
max. Leistungsaufnahme Max. power input Consumation maximale Max. opgenomen vermogen	230/115/24/... Vac	24 Vdc		Potentiaalfreier Kontakt Über den potentiaalfreien Kontakt kann das Alarmsignal weitergeleitet werden (z.B. an einen Leitschalt). Der Umschaltkontakt kann z.B. im Fail-safe-Modus betrieben werden:
Netzspannung (siehe Typenschild) Supply voltage (see type plate) Alimentation électrique (voir plaque sign.) Voeding (zie Typeplaatje)	P < 2,0 VA Uac = ... ± 10% 50 – 60 Hz	P < 2,0 W U ₀ = 24Vdc -10/+25%		Liegt Betriebsspannung an und arbeitet der BEKOMAT störungsfrei ist das Alarmsignal angezeigt. Der Arbeitskontakt (0.7 - 0.8) ist geschlossen.
empfohlener Kabelmanteldurchmesser recommended cable jacket diameter diamètre recommandé pour la gaine du câble aanbevolen kabeldoorsnede	ø 5,8 - 8,5 mm			Liegt keine Betriebsspannung an oder erfolgt eine Störmeldung fällt das Alarmsignal ab. Der Arbeitskontakt ist offen (Alarm).
Kabelquerschnitt und Absicherung Cable cross-section and fuse protection Section des fils et fusibles Kabeldoorsnede en verzekering	3 x 0,75 mm ² / 5 x 0,25 mm ² 0,5 A *) 100 mA **)			Externer Test-Taster (optional) Damit kann ferngesteuert vorhandenes Kondensat gezielt abgeleitet werden. Die normale Test-Taster-Funktion ist hier zusätzlich aus dem BEKOMAT herausgeführt. Wird der externe Kontakt geschlossen, öffnet das Ventil.
Kontaktbelastung Contact loading Pouvoir de coupure Contactbelasting	< 250 Vac / < 1,0 A > 5 Vdc / > 10 mA			*) mittl. träge) min. Spannungsquellen- Innenwiderstand Ri > 12 Ohm
Wartung • Maintenance • Entretien • Onderhoud				
				Empfehlung zur Wartung: <ul style="list-style-type: none"> Jährlich Gehäuse und Ventil reinigen Jährlich Verschleißteile ersetzen Verschleißteilsatz (x) BEKOMAT 13 XE KA13 101 BEKOMAT 13 CO XE KA13 101 BEKOMAT 13 CO PN25 XE KA13 301 BEKOMAT 13 CO PN40 XE KA13 301
				Funktions-test des BEKOMAT: <ul style="list-style-type: none"> Test-Taster ca. 2 sek. betätigen. Ventil öffnet zur Kondensatableitung Überprüfung der Störmeldung: <ul style="list-style-type: none"> Kondensatzulauf absperren Test-Taster mind. 1 Minute betätigen rote LED blinkt (nach 1 Minute) Alarmsignal wird durchgeschaltet

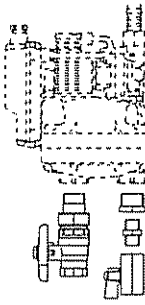
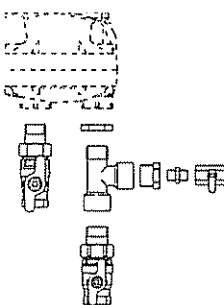
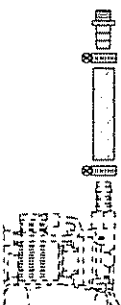

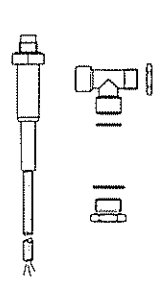
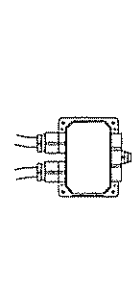
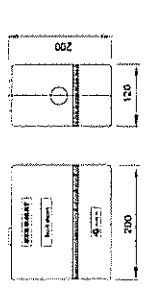
englisi	französis	neders
Potential-free contact The alarm signal can be relayed via a potential-free contact. The changeover contact can be operated, e.g., in the fail-safe mode. When operating voltage is being applied and the BEKOMAT device is functioning correctly, the alarm relay is energized. The contact element (0.7 - 0.8). When there is no operating voltage or in the case of a fault signal, the alarm relay drops out. The contact element is open (alarm). External Test button (optional) Here, the normal test button function has been extended for additional use outside the BEKOMAT unit. This makes it possible to discharge any condensate in the unit by remote control, if required. When the external contact closes, the valve will open. *) time lag **) min. internal resistance of voltage source Ri > 12 Ohm	Contact sans potentiel Un contact sans potentiel permet le report de l'alarme. Le contact inverseur peut être exploité par exemple en mode fail-safe : Si la tension de service est présente et si le BEKOMAT fonctionne normalement, le relais d'alarme est excité. Le contact de travail (0.7 - 0.8) est fermé. Si la tension d'alimentation n'est pas présente ou si un signal d'alarme est émis, le relais d'alarme est désexcité. Le contact de travail est ouvert (Alarme). Bouton test externe (en option) Celui-ci permet d'effectuer une commande à distance de la purge. La fonction normale de la touche Test est ainsi reportée sur un contact externe. Lorsque ce contact est fermé, la vanne s'ouvre. *) temporisée **) résistance interne min. de la source de tension Ri > 12 Ohm	Potentiaalvrij contact Via het potentiaalvrij contact kan het alarmsignaal aan een centraal meldpunt worden doorgegeven. Het contact kan b.v. werken volgens de fail-safe-modus. Staat er spanning op de BEKOMAT en werkt hij storingsvrij, dan is het alarmrelais verbonden. Het werkcontact (0.7 - 0.8) is gesloten. Indien de BEKOMAT spanningsloos is of een storingsmelding geeft, wordt het alarmrelais onderbroken. Het werkcontact is open (alarm). Externe Test-schakelaar (optie) Hiermee kan op afstand de BEKOMAT bediend worden. De normale testschakelaarfunctie is hiermee extern te bedienen. Wanneer het externe contact wordt gesloten, opent het ventiel. *) traag **) min. Spannungsquellen-innenwiderstand Ri > 12 Ohm
Maintenance recommendation: <ul style="list-style-type: none"> Housing and valve should be cleaned once a year. Replace wearing parts once a year. Set of wearing parts (x) BEKOMAT 13 XE KA13 101 BEKOMAT 13 CO XE KA13 101 BEKOMAT 13 CO PN25 XE KA13 301 BEKOMAT 13 CO PN40 XE KA13 301	Recommandations pour l'entretien : <ul style="list-style-type: none"> 1 fois par an, nettoyer le boîtier et la soupape 1 fois par an, remplacer les pièces d'usure Kit de pièces d'usure (x) BEKOMAT 13 XE KA13 101 BEKOMAT 13 CO XE KA13 101 BEKOMAT 13 CO PN25 XE KA13 301 BEKOMAT 13 CO PN40 XE KA13 301	Advies voor onderhoud: <ul style="list-style-type: none"> Jaarlijks behuizing en ventiel reinigen Jaarlijks preventief onderhoud plegen Onderdeelsel (x) BEKOMAT 13 XE KA13 101 BEKOMAT 13 CO XE KA13 101 BEKOMAT 13 CO PN25 XE KA13 301 BEKOMAT 13 CO PN40 XE KA13 301
Functional test of BEKOMAT device: <ul style="list-style-type: none"> Briefly press test button 2 sec. Valve opens for condensate discharge. Checking of alarm signal: <ul style="list-style-type: none"> Shut off condensate inflow. Press test button for at least 1 minute. Red LED flashes (after 1 minute). Alarm signal is being relayed. 	Test de fonctionnement du BEKOMAT: <ul style="list-style-type: none"> Pression brève sur la touche Test 2 s La soupape s'ouvre pour la purge Vérification du signal d'alarme : <ul style="list-style-type: none"> Obturer l'arrivée de condensat Presser la touche Test pendant 1 minute au moins La LED rouge clignote (après 1 minute) Le signal d'alarme est activé 	Functietest van de BEKOMAT: <ul style="list-style-type: none"> Testschakelaar 2 seconden indrukken Ventiel opent voor condensaatvoer Controle van (externe) storingsmelder: <ul style="list-style-type: none"> Kondensaattoevoer afsluiten Testschakelaar 1 minuut indrukken Rode LED knippert (na 1 minuut) Alarmsignaal wordt doorgeschakeld

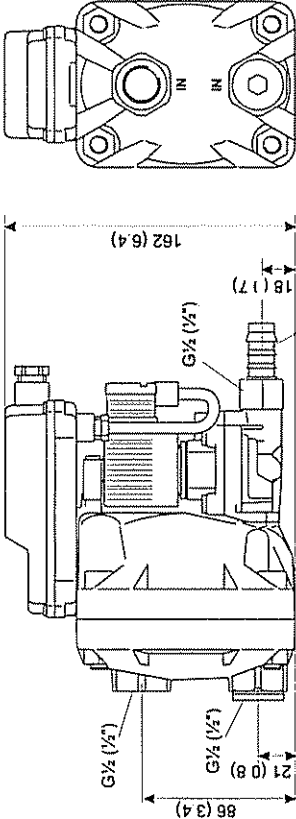
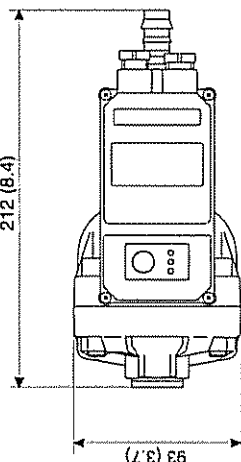
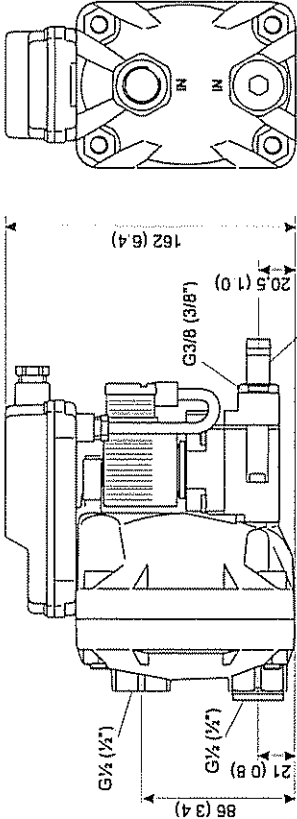
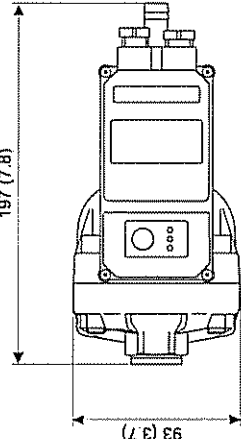
Re	Fehlersuche • Trouble shooting rche de panne • Storingsoorzaken	D	utsch
<div><div>Alarm </div><div>Valve </div><div>Power </div></div> <div><div>TEST</div></div>	<p>keine LED leuchtet No LED lighting up Aucune LED n'est allumée Geen enkele LED brandt</p>	<p><u>Mögliche Ursachen:</u></p> <ul style="list-style-type: none">Spannungsversorgung fehlerhaftNetzleitplatine defektSteuerplatine defektSpannung auf Typenschild ablesenSpannung auf Netzleitplatine an Klemmen 0.0 - 0.1 - 0.2 prüfen.24 Vdc-Spannung auf Steuerplatine an Klemmen 1.0 - 1.1 prüfen (ohne Last bis 36 Vdc messbar)Steckerverbindung/Fachbandkabel prüfen	
<div><div>Alarm </div><div>Valve </div><div>Power </div></div> <div><div>TEST</div></div>	<p>Test-Taster ist betätigt, aber keine Kondensatableitung Pressing of test button, but no condensate discharge La touche Test est actionnée, mais sans purge du condensat De testknop is ingedrukt, maar er is geen kondensaatafvoer</p>	<p><u>Mögliche Ursachen:</u></p> <ul style="list-style-type: none">Zu- und/oder Ablaufleitung abgesperrt oder versperrtVerschleißSteuerplatine defektMagnetventil defektZu- und Ablaufleitung kontrollierenVerschleißteile austauschenPrüfen, ob Ventil hörbar öffnet (Test-Taster mehrmals betätigen)24 Vdc-Spannung auf Steuerplatine an Klemmen 3.0 - 3.1 - 3.2 prüfen (ohne Last bis 36 Vdc messbar)	
<div><div>Alarm </div><div>Valve </div><div>Power </div></div> <div><div>TEST</div></div>	<p>Kondensatableitung nur wenn Test-Taster betätigt ist Condensate discharge only when test button is being pressed Purge du condensat uniquement si la touche Test est actionnée Kondensaat wordt alleen afgevoerd als de testknop is ingedrukt</p>	<p><u>Mögliche Ursachen:</u></p> <ul style="list-style-type: none">Zulaufleitung ohne ausreichendes Gefällezu hoher KondensatanfallFühlerrohr sehr stark verschmutztMindestdruck unterschrittenZulaufleitung mit Gefälle verlegenLuftausgleichsleitung installierenFühlerrohr reinigenMindestdruck sicherstellen oder Low Pressure- oder Vakuumableiter installieren	
<div><div>Alarm </div><div>Valve </div><div>Power </div></div> <div><div>TEST</div></div>	<p>Gerät bläst permanent ab Device keeps blowing off air L'appareil refoule de l'air en permanence De BEKOMAT blaast continue af</p>	<p><u>Mögliche Ursachen:</u></p> <ul style="list-style-type: none">Steuerleitung versperrtVerschleißVentileinheit komplett reinigenVerschleißteile austauschenFühlerrohr reinigen	

engl	französis	ner	nds
<p>Possible causes:</p> <ul style="list-style-type: none"> Power supply faulty Power supply board defective Control PCB defective Check voltage on type plate. Check voltage on power supply board at terminals 0.0 - 0.1 - 0.2. Check 24 Vdc voltage on control PCB at terminals 1.0 - 1.1 (without load up to 36 Vdc may be measured) Check plug connection/ribbon cable 	<p>Origines possibles :</p> <ul style="list-style-type: none"> Défaut d'alimentation électrique Carte d'alimentation défectueuse Carte de commande défectueuse Relever la tension sur la plaque Vérifier la tension sur la carte d'alimentation, aux bornes 0.0 - 0.1 - 0.2. Vérifier la tension de 24 Vdc sur la carte de commande, aux bornes 1.0 - 1.1 (mesurable sans charge jusqu'à 36 Vdc) Vérifier l'aisson enfichable/câble en nappe 	<p>Mögliche oorzaken:</p> <ul style="list-style-type: none"> Spanning onjuist aangesloten Voedingsprint defect Besturingsprint defect Spanning op typeplaatje aflezen Spanning op voedingsprint op contact 0.0 - 0.1 - 0.2 controleren. 24 Vdc-spanning op de besturingsprint (onbelast tot 36 Vdc mogelijk) Stekkerverbinding/flechtable controleren 	
<p>Possible causes:</p> <ul style="list-style-type: none"> Feed and/or outlet line shut off or blocked Wear Control PCB defective Electronoid valve defective Check feed line and outlet line Replace worn parts Check if valve opens audibly (press test button several times) Check 24 Vdc voltage on control PCB at terminals 3.0 - 3.1 - 3.2 (without load up to 36 Vdc may be measured) 	<p>Origines possibles :</p> <ul style="list-style-type: none"> Conduites d'arrivée et/ou d'évacuation obturées ou bouchées Usure Carte de commande défectueuse Electrovanne défectueuse Contrôler l'arrivée et l'évacuation Remplacer les pièces d'usure Vérifier si l'ouverture de la soupape est perceptible (Presser plusieurs fois la touche Test) Vérifier les 24 Vdc sur la carte de commande, aux bornes 3.0 - 3.1 - 3.2, (mesurable sans charge jusqu'à 36 Vdc) 	<p>Mögliche oorzaken:</p> <ul style="list-style-type: none"> Toe- en/of afvoerleiding afgesloten of verslopt Onderdelen aan vervanging toe Besturingsprint defect Magneetventiel defect Toe- en afvoerleiding controleren Onderdelen vervangen Testen, of het ventiel hoorbaar opent (testknop meerdere malen indrukken) 24 Vdc-spanning op besturingsprint op contact 3.0 - 3.1 - 3.2 controleren, (onbelast tot 36 Vdc mogelijk) 	
<p>Possible causes:</p> <ul style="list-style-type: none"> Feed line with insufficient slope Excessive condensate quantities Sensor tube extremely dirty Dropping below necessary minimum pressure Lay feed line with adequate slope Install venting line Clean sensor tube Ensure minimum pressure, otherwise install low-pressure or vacuum condensate drain 	<p>Origines possibles :</p> <ul style="list-style-type: none"> Conduite d'arrivée avec pente insuffisante Trop de condensat produit Tube de sonde fortement encrassé Pression minimale non atteinte Réaliser l'arrivée avec une pente adéquate Installer une conduite d'équilibrage d'air Nettoyer le tube de sonde Assurer la pression minimale ou installer un purgeur Low Pressure ou à dépression 	<p>Mögliche oorzaken:</p> <ul style="list-style-type: none"> Toevoerleiding heeft onvoldoende vervall Te grote hoeveelheid condensaat Voeler zeer sterk vervuild Minimale werkdruk te laag Toevoerleiding onder afschol monteren Onluchtingsleiding installeren Voeler reinigen Voldoen aan de minimale werkdruk of een lagedruk- of vacuüm-BEKOMAT installeren. 	
<p>Possible causes:</p> <ul style="list-style-type: none"> Control air line blocked Wear Clean entire valve unit Replace worn parts Clean sensor tube 	<p>Origines possibles :</p> <ul style="list-style-type: none"> Conduite d'équilibrage d'air bouchée Usure Nettoyer entièrement le module soupape Remplacer les pièces d'usure Nettoyer le tube sonde 	<p>Mögliche oorzaken:</p> <ul style="list-style-type: none"> Stuurluchtleiding verstopt Onderdelen aan vervanging toe Ventileenheid compleet reinigen Onderdelen vervangen Voeler reinigen 	

Ersatzteil-Set • Spare part kits pièces de rechange • Onderdeelsets		Deutsch
BEKOMAT 13		
Bestell-Nr. • order ref. No de com. • Bestelnr.	Inhalt • content • contente • inhoud	Lieferbare Ersatzteil-Sets
XE KA13 101	2, 32, 42, 44, 45, 46, 49, 50, 51, 53	Verschleißteilsatz
XE KA13 102	32, 33, 34, 39, 42, 47, 48, 49, 52 - 55	Ventilanbauteile
XE KA13 103	32, 33, 34, 38 - 55	Ventileinheit, komplett
XE KA13 104	2, 10, 12, 14, 19, 32, 40, 42, 44, 49, 53	Dichtungssatz
XE KA13 105	1, 2, 4, 5, 9, 10, 12, 16, 32, 53	Gehäuse, komplett
XE KA13 106	2 - 7	Gehäusedeckel
BEKOMAT 13 CO		
Bestell-Nr. • order ref. No de com. • Bestelnr.	Inhalt • content • contente • inhoud	Lieferbare Ersatzteil-Sets
XE KA13 101	2, 32, 42, 44, 45, 46, 49, 50, 51, 53	Verschleißteilsatz
XE KA13 202	32, 33, 34, 39, 42, 47, 48, 49, 52 - 55	Ventilanbauteile
XE KA13 203	32, 33, 34, 38 - 55	Ventileinheit, komplett
XE KA13 104	2, 10, 12, 14, 19, 32, 40, 42, 44, 49, 53	Dichtungssatz
XE KA13 205	1, 2, 4, 5, 9, 10, 12, 16, 32, 53	Gehäuse, komplett
XE KA13 206	2 - 7	Gehäusedeckel
BEKOMAT 13 CO PN25, 13 CO PN40		
Bestell-Nr. • order ref. No de com. • Bestelnr.	Inhalt • content • contente • inhoud	Lieferbare Ersatzteil-Sets
XE KA13 301	2, 32, 42, 44, 45, 46, 49, 50, 51, 53	Verschleißteilsatz
XE KA13 302	32, 33, 34, 39, 42, 47, 48, 49, 52 - 55	Ventilanbauteile
XE KA13 303	32, 33, 34, 38 - 55	Ventileinheit, komplett
XE KA13 304	2, 10, 12, 14, 19, 32, 40, 42, 44, 49, 53	Dichtungssatz
XE KA13 305	1, 2, 4, 5, 9, 10, 12, 16, 32, 53	Gehäuse, komplett
XE KA13 306	2 - 7	Gehäusedeckel
BEKOMAT 13, 13 CO, 13 CO PN25, 13 CO PN40		
Bestell-Nr. • order ref. No de com. • Bestelnr.	Inhalt • content • contente • inhoud	Lieferbare Ersatzteil-Sets
XE KA13 001	17, 18	Platine "Steuerung"
XE KA12 002	18, 27	Platine "Netzteil" (230 Vac / 24 Vdc)
XE KA12 003	18, 27	Platine "Netzteil" (115 Vac / 24 Vdc)
XE KA12 004	18, 27	Platine "Netzteil" (24 Vac / 24 Vdc)
XE KA12 005	19 - 26	Haubenoberteil, komplett

engl		français		nederlandse	
Available sets of spare parts		Kits de pièces de rechange disponibles		Verrijgbare onderdeelsets	
Set of wearing parts		Kit de pièces d'usure		Serviceset	
Valve mounting parts		Pièces fixation vanne		Set onderdelen t.b.v. ventielunit	
Valve unit, complete		Module electrovanne, complet		Ventielunit, compleet	
Set of seal		Jeu de joints d'étanchéité		Afdichtingsset	
Housing, complete		Boîtier, complet		Behuizing, compleet	
Housing lid		Couvercle du boîtier		Deksel behuizing, compleet	
Available sets of spare parts		Kits de pièces de rechange disponibles		Verrijgbare onderdeelsets	
Set of wearing parts		Kit de pièces d'usure		Serviceset	
Valve mounting parts		Pièces fixation vanne		Set onderdelen t.b.v. ventielunit	
Valve unit, complete		Module electrovanne, complet		Ventielunit, compleet	
Set of seal		Jeu de joints d'étanchéité		Afdichtingsset	
Housing, complete		Boîtier, complet		Behuizing, compleet	
Housing lid		Couvercle du boîtier		Deksel behuizing, compleet	
Available sets of spare parts		Kits de pièces de rechange disponibles		Verrijgbare onderdeelsets	
Set of wearing parts		Kit de pièces d'usure		Serviceset	
Valve mounting parts		Pièces fixation vanne		Set onderdelen t.b.v. ventielunit	
Valve unit, complete		Module electrovanne, complet		Ventielunit, compleet	
Set of seal		Jeu de joints d'étanchéité		Afdichtingsset	
Housing, complete		Boîtier, complet		Behuizing, compleet	
Housing lid		Couvercle du boîtier		Deksel behuizing, compleet	
Available sets of spare parts		Kits de pièces de rechange disponibles		Verrijgbare onderdeelsets	
PCB „control“		Carte "Commande"		Bestuursprint	
PCB „power supply“ (230 Vac / 24 Vdc)		Carte "Alim." (230 Vac / 24 Vdc)		Voedingsprint (230 Vac / 24 Vdc)	
PCB „power supply“ (115 Vac / 24 Vdc)		Carte "Alim." (115 Vac / 24 Vdc)		Voedingsprint (115 Vac / 24 Vdc)	
PCB „power supply“ (24 Vac / 24 Vdc)		Carte "Alim." (24 Vac / 24 Vdc)		Voedingsprint (24 Vac / 24 Vdc)	
Top of cover, complete		Partie sup. du boîtier élec., complète		Kunststof bovenkap, compleet	

Zubehör • Accessories • Accessoires • Accessoires		
	Anschluss-Set 1 Connection set 1 Kit de raccordement 1 Aansluitset 1	Bestellnummer Order reference N° de commande Bestelnummer XZ KA13 003 *)
	Anschluss-Set 2 Connection set 2 Kit de raccordement 2 Aansluitset 2	Bestellnummer Order reference N° de commande Bestelnummer XZ KA13 004 *)
	Ablauf-Set Discharge set Kit d'évacuation Afvoerset	Bestellnummer Order reference N° de commande Bestelnummer XZ KA12 001
	Haltewinkel Fixing brackets Etrier Montagebeugel	Bestellnummer Order reference N° de commande Bestelnummer XZ KA13 002 *)
	Thermostatisch geregelte Heizung Thermostatically controlled heating Chauffage à régulation thermostatique Thermostatisch geregelde verwarming	Bestellnummer Order reference N° de commande Bestelnummer XZ KA00 121 *)
	Rohrbeheizheizung für Zu-/Abfluss Trace heating for inlet/outlet Système hors gel pour arrivée/évacuation Verwarmingband voor toe- en afvoer	Bestellnummer Order reference N° de commande Bestelnummer XZ KA00 HB2
	Isolationssschalen Insulating shells Coquilles d'isolation Isolatieschild	Bestellnummer Order reference N° de commande Bestelnummer XZ KA13 001 *) Nur bis 25 bar zugelassen Only allowed up to 25 bar. Maximaal 25 bar

Messungen • Dimensions • Dimensions • Afmetingen		
		BEKOMAT 13 CO PN25 BEKOMAT 13 CO PN40
		BEKOMAT 13 CO PN25 BEKOMAT 13 CO PN40



Herstellereklärung

Wir erklären hiermit, dass die nachfolgend bezeichneten Produkte in den von uns gelieferten Ausführungen auf der Basis eines nach EN ISO 9001 zertifizierten Qualitätsmanagementsystems gefertigt werden.

Produktbezeichnung: Kondensatableiter

Typenbezeichnung: BEKOMAT 3 / 6 / 8 / 9 / 10 / 12 / 13 / 14 / 16 / 20 / 21

Die gleichbleibende Qualität der Produkte wird durch folgende Maßnahmen gestichert:

1. Wareneingangsprüfung
2. fertigungsbegleitende Prüfung
3. Endkontrolle
 - Funktionsprüfung
 - Drucktest
 - Dichtheitsprüfung

Neuss, 29.09.2005

BEKO TECHNOLOGIES GMBH

ppa. Werner Koslowski
GMH



Manufacturer's Declaration

We hereby declare that the following products, in the specifications as they were delivered, are designed and manufactured based on a Quality Management System certified to EN ISO 9001.

Description of product: Condensate drain

Type designation: BEKOMAT 3 / 6 / 8 / 9 / 10 / 12 / 13 / 14 / 16 / 20 / 21

The constant quality of the products is ensured by following measures:

1. Incoming inspection
2. continuous inspections along with assemblage
3. final inspection with
 - function test
 - pressure test
 - leak test

Neuss, 29.09.2005

BEKO TECHNOLOGIES GMBH

ppa. Werner Koslowski
GMH

6.19 2 WAY VALVES DN 15 TO DN 50 (NORGREN)

Location	Reference
DRYER	DN 15 to DN 50



2/2-way valves DN 15 to DN 50

for neutral gases and liquids

pressure actuated by external fluid

Seat valves

Internal threads G 1/2 to G 2 or 1/2" NPT to 2" NPT

Operating pressure see table page 2

82180

82190

82280

82290

Description (standard valve)

Flow direction:	fixed
Mounting position:	optional
Flow fluid range	
Fluid temperature:	-10°C up to max. +180°C
Ambient temperature:	-10°C up to max. +60°C
Material body:	dezincification brass (CW602N)
Seat seal:	PTFE
Internal parts:	brass, stainless steel
Spindle sealing:	PTFE / FPM; self-adjustable

Pilot fluid range

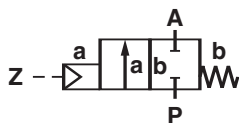
Pilot connection:	G 1/4 resp. 1/4" NPT
Pilot fluid:	neutral gaseous fluids
Fluid temperature:	max. +60°C
Material body:	stainless steel, aluminium WEMA-Kor coated
Seat seals:	NBR
Internal parts:	coated steel



Features

- High flow rate
- Suitable for contaminated flow fluid
- Damped closing (Valves closes against flow direction)
- Robust design
- Suitable for vacuum up to max. 90%

Symbol



Ordering information

To order, quote model number from table overleaf, e.g. 8218200.0000 for a G 1/2 valve without pilot valve

Characteristic data See page 2 valve and solenoid informations.

NPT - connection available: change (e.g.) 8218200 in 8219200; 8228500 in 8229500

Detmolder Strasse 256
D-32545 Bad Oeynhausen
PO Box 10 02 52-53
D-32502 Bad Oeynhausen
Phone ++49 5731 / 7 91-0
Fax ++49 5731 / 791-179
<http://www.buschjost.com>
mail@buschjost.de



Characteristic data

Valves

Part Number	Nominal Diameter (mm)	Port size	Pilot pressure		Operating pressure *		kv-value *** (Base m³/h)	Weight ** (kg)
			min.	max. (bar)	min	max (bar)		
8218200.0000 8219200.0000	15	G 1/2 1/2" NPT	3.5	8	0	16.0	4.8	1.4
8218300.0000 8219300.0000	20	G 3/4 3/4" NPT	3.5	8	0	10.0	10.0	15
8218400.0000 8219400.0000	25	G 1 1" NPT	3.5	8	0	10.0	14.0	1.8
8218500.0000 8219500.0000	32	G 1 1/4 1 1/4" NPT	3.5	8	0	7.0	23.0	2.4
8218600.0000 8219600.0000	40	G 1 1/2 1 1/2" NPT	3.5	8	0	4.5	30.0	2.7
8218700.0000 8219700.0000	50	G 2 2" NPT	3.5	8	0	3.0	37.0	3.9
8228500.0000 8229500.0000	32	G 1 1/4 1 1/4" NPT	3.5	8	0	16.0	27.0	5.3
8228600.0000 8229600.0000	40	G 1 1/2 1 1/2" NPT	3.5	8	0	10.0	37.0	5.5
8228700.0000 8229700.0000	50	G 2 2" NPT	3.5	8	0	10.0	53.0	7.0

* with gaseous and liquid fluids up to 600 mm²/s (cSt)

State voltage [V] and frequency [Hz]

** without pilot valve

*** C_V-value (US) ≈ k_V-value x 1.2

Notes for 3/2-way pilot valve 84660/84680

Material body brass 2.0402

Pilot fluid temperature max. +60°C

Pilot pressure: 1-10 bar

Standard voltages: 24 V DC, 24 V AC; 230 V AC

Electrical Data for 3/2-way pilot valve 84660/84680

Technical data see publication D111402

Design acc. to DIN VDE 0580

Voltage range ±10%

Duty cycle (ED) 100%

Protection class to EN 60529 IP65 with mounted Socket

Socket acc. to DIN EN 175301-803A

Options

available at extra cost

XXXXX01.XXXX

Normally open, closes with pilot pressure and und
opens with spring force (pilot pressure 1 – 6 bar)

XXXXX22.XXXX

Operating pressure G 1/2 25 bar,
G 3/4 16 bar

XXXXX23.XXXX

Double electrical position indicator with 2 solenoid
switches

XXXXX52.XXXX

Optical position indicator

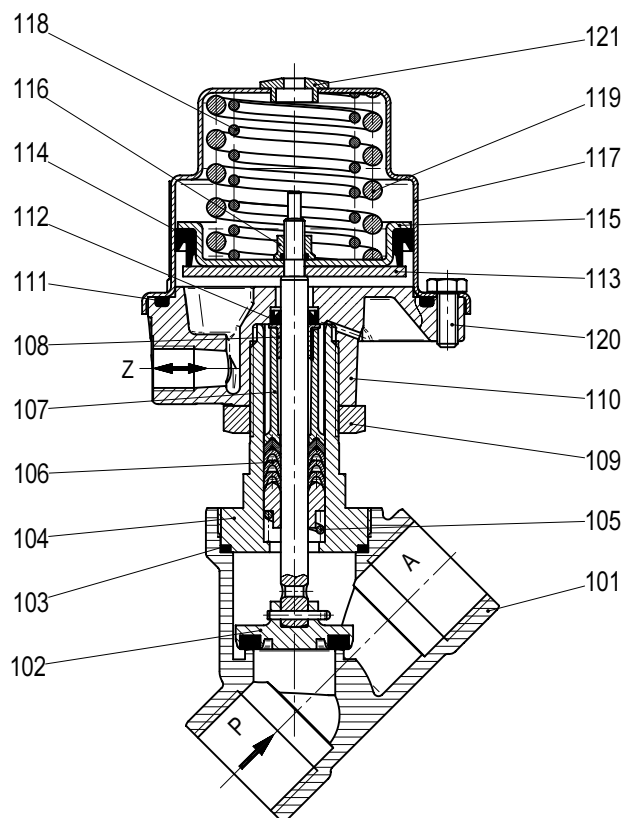
XXXXX59.XXXX

Fluid temperature max. 200 °C

On Request

- Further versions
- For hazardous area

Section view



- 101 Valve body
- *102 Valve spindle, complete
- *103 Seal ring
- 104 Screw piece
- *105 Pressure spring
- *106 Seal packing
- 107 Spacer bush
- *108 Plain bearing
- 109 Nut
- 110 Control head housing cover, bottom part
- *111 O-ring
- *112 Grooved ring
- 113 Round plate

- *114 Grooved ring
- 115 Round plate
- *116 Seal-lock-nut
- 117 Control head housing
- *118 Pressure spring
- *119 Pressure spring
- 120 Hexagon screw
- 121 Plug

* These individual parts form a complete wearing unit.
When ordering spare parts please state Cat no and series no.

Note to Pressure Equipment Directive (PED):

The valves of this series, including the connection-size DN 25 (G 1), are according to Art. 3 § 3 of the Pressure Equipment Directive (PED) 97/23/EG. This means interpretation and production are in accordance to engineers practice wellknown in the member countries.

The CE-sign at the valve refers not to the PED. Thus the declaration of conformity is not longer applicable for this directive.

For valves > DN 25 (G 1) Art. 3 § (1) No.1.4 applies.

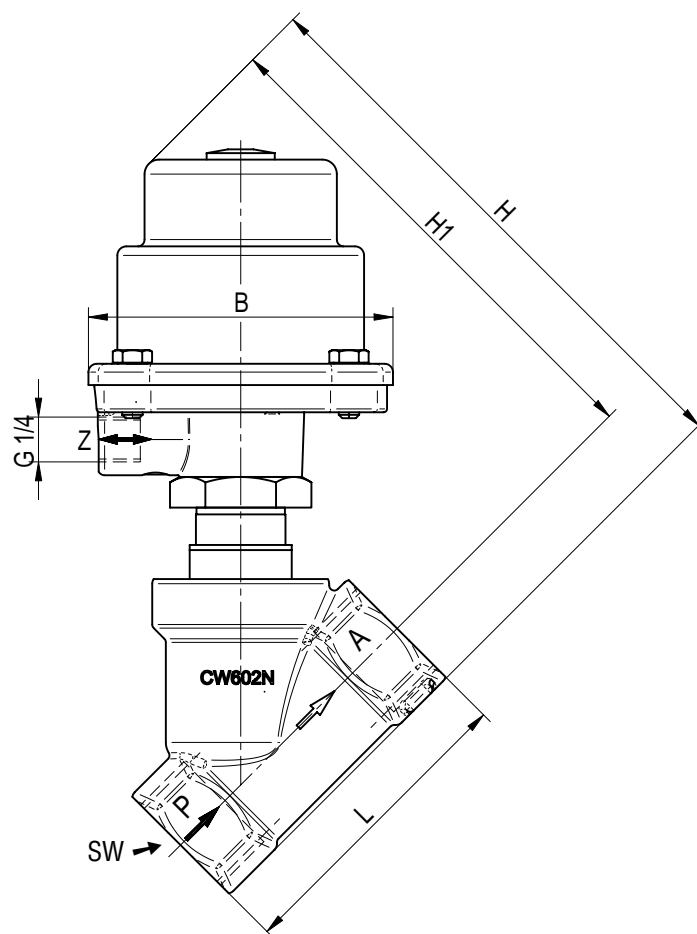
The basic requirements of the Enclosure I of the PED must be fulfilled. The CE-sign at the valve includes the PED. A certificate of conformity of this directive will be available on request.

Note to Electromagnetic Compatibility Guideline (EEC):

The valves shall be provided with an electrical circuit which ensures the limits of the harmonised standards EN 50081-1 and EN 50082-1 are observed, and hence the requirements of the Electromagnetic Compatibility Guideline (89/336/EEC) satisfied.

General Dimensions

Actuator may be rotated 360°



Part Number	Connection	L mm	B mm	H mm	H1 mm	SW mm
8218200.0000 8219200.0000	G 1/2 1/2" NPT	65	89.5	154.0	140.5	27
8218300.0000 8219300.0000	G 3/4 3/4" NPT	75	89.5	160.0	144.0	32
8218400.0000 8219400.0000	G 1 1" NPT	90	89.5	171.0	150.5	41
8218500.0000 8219500.0000	G 1 1/4 1 1/4" NPT	110	89.5	186.0	161.0	50
8218600.0000 8219600.0000	G 1 1/2 1 1/2" NPT	120	89.5	190.0	162.5	55
8218700.0000 8219700.0000	2 2" NPT	150	89.5	206.0	171.0	70
8228500.0000 8229500.0000	G 1 1/4 1 1/4" NPT	110	163.0	250.0	225.0	50
8228600.0000 8229600.0000	G 1 1/2 1 1/2" NPT	120	163.0	255.0	227.5	55
8228700.0000 8229700.0000	G 2 2" NPT	150	163.0	270.0	235.0	70

Brief Operating Instructions for Pressure Actuated Valves

Use as Intended

For safety and reliability this valve must be operated within the permissible limits and in accordance with these instructions, otherwise the user will be solely liable for any resultant damage or injury. Tampering or unauthorised modification of the valve, or failure to follow these instructions, invalidates the warranty so we are no longer liable. The valve must not be operated with fluids that chemically attack or mechanically damage its constituent materials. If there are no empirical values indicating suitability available, it is advisable to seek clarification from our application engineers. Valves \leq DN25 comply with Article 3, Clause 3 of the Pressure Vessels Directive (97/23/EC). These operating instructions form part of the product and must be kept safely available over the service life of the valve.

Safety Precautions

These safety precautions only relate to the individual valve. In combination with other items of equipment there may be other potential dangers, which must be taken into account by carrying out a risk analysis for the system.

- Before commissioning, ensure that any fluid escaping from unsecured openings when the valve is actuated for the first time cannot give rise to danger.
- To prevent damage to internal parts as a result of pressure surges, prime the valve slowly when commissioning.
- **DANGER!** To avoid the risk of getting burnt be careful not to touch the surface of the solenoid, which will heat up to 120 °C during continuous duty!
- **DANGER!** NO valves are open in the absence of control voltage.
Secure to prevent any fluid escaping during commissioning.
- The valves are not designed to withstand the fluid freezing.
- Leak and strength tests with the valve open or closed are permitted at up to 1.5 times the maximum working pressure. The valve must not be switched during these tests.
- **DANGER!** For safety reasons it is vital to connect the earth wire to the marked terminal provided for the purpose!
- Ensure the power is switched off before connecting the valve!
- Operating AC solenoids without the plunger and plunger tube will cause them to burn out!

Mounting

Clean pipework before mounting valve. If necessary, fit strainer upstream of the valve inlet to prevent any coarse dirt leading to malfunctions. Avoid distorting the body of the valve in misaligned pipework, or by using inappropriate tools or sealing material. Do not use the actuator/solenoid as a lever.

Tighten (G1/4 or NPT1/4) pilot connections to maximum torque of 25 Nm when fitting.

The valve will only close tightly in the direction of flow. Flow in the opposite direction to the arrow may irreparably damage components. The valve can be mounted in any position.

Electrical Connection

Connect solenoid in accordance with the electrical regulations. Then close the terminal compartment carefully to restore protection. Make sure the cable entry is sealed properly. Tighten central screw of the power lead socket to a maximum of 60 Ncm. The housing must not show signs of deformation. Ensure correct polarity of terminals marked + and - . If unmarked, the supply wires can be connected either way round. It is advisable to carry out an operating test before pressurising. The clicking (impact) of the plunger must be audible during switching.

Technical Data

Check that the actual service conditions are in line with the rating plate and table showing product range. The limits for the particular application must not be exceeded. Do not exceed the maximum permissible fluid temperatures shown in the tables opposite.

With EEx solenoids the service temperatures are limited to:

Tambient = -20 to +40°C; Tfluid = class T3: +80°C, classes T4 and T5: +60°C, class T6: +40°C

Maintenance

Maintenance, inspection and installation may only ever be carried out by authorised and qualified specialists, after the system has been depressurised and allowed to cool down, and the solenoid disconnected from the power supply.

DANGER! Dismantling the spring loaded actuators without the right tool may cause injuries (this does not apply to the 845xxx / 84720 – 84770 series of valves)! Do not exceed maximum torque of 4 Nm when replacing the visual position indicator!

It is advisable to carry out preventive maintenance at intervals depending on the service conditions, and whenever there is a noticeable deterioration in the speed of switching. The user is responsible for specifying test and service intervals appropriate to the service conditions of the valve. Deposits, dirt, perished or worn seals may lead to malfunctions. To maintain the level of protection, include the solenoid seals in the maintenance.

Operating Instructions

Leaflets with sectional drawing, key to parts and fitting instructions for kits of wearing parts are available on request. Please quote the 16-digit catalogue number and the series number. Data sheets and detailed operating instructions for standard series are available for download from the Internet: www.buschjost.de

Pressure Equipment Directive (97/23/EEC)

A Declaration of Conformity can be issued on request for category I and II valves.

Notes on Directive 2004/108/EC (Electromagnetic Compatibility - EMC)

The solenoids meet all of the requirements of the generic standards for Interference (EN 61000-6-3) and Interference Immunity (EN 61000-6-1). Solenoids not incorporating rectifiers also meet the requirements of EN 61000-6-3. Before commissioning, ensure the entire machine or system meets the requirements of the EMC Directive.



Detmolder Str. 256
D-32545 Bad Oeynhaus

PO Box 10 02 52-53
D-32502 Bad Oeynhaus

Phone ++49 5731/791-
Fax ++49 5731/791-

<http://www.buschjost.com>
mailto:mail@buschjost.de

Declaration of Conformity

according to Annex VII of the Pressure Equipment Directive 97/23/EC

We hereby declare under our sole responsibility that the
pressure actuated seat valves of the:
82180, 82280, 82380, 82480, 82580, 82700, 82710,
82720, 82810, 84500, 84510, 84520, 84530, 84540,
84550, 84580, 84590, 84880, 84890, 84720, 84730,
84740, 84750, 84760, and 84770 series, and the addition-
al models and special designs 849XXX derived from
these

to which this declaration relates are in conformity with Directive 97/23/EC and have been
subjected to the following procedure for assessing conformity:

**In-house inspection of production with monitoring of acceptance
(Module A1)**

Harmonised standards applied:

EN 13445

EN 19

Other applicable directives

89/336/EEC – Electromagnetic Compatibility

73/23/EEC – Low Voltage

Note

Valves \leq DN25 are in conformity with the Pressure Equipment Directive 97/23/EC, Clause 3,
Para 3. Their CE mark relates to EC directives other than the Pressure Equipment Directive.

Monitoring is carried out by the specified body with identification No 0045 (TÜV Nord).

DP


Design Management

DP


Quality Assurance Management

Bad Oeynhausen, September 23, 2002

HRA 498 Bad Oeynhaus

Complementary:
IMI Norgren Buschjost
Verwaltungs GmbH
HRB 91 Bad Oeynhausen

General Manager:
Thomas Voigt



Address : ECL, 100 Rue Chaland
59790 RONCHIN – FRANCE
Phone : +33 (0)3 20 88 70 70
Fax : +33 (0)3 20 88 70 99
Email : contact@ecl.fr

MA'ADEN

POT TENDING MACHINE

MAINTENANCE MANUAL

CLIENT Contract : 25457-4230-POA-MJKT-0001
Manual : 25457-4230-V1A-MJKT-0123

ECL Contract : P1034
Manual : 1-10-961-16

VOLUME 3/3

Date	Rev.	Written by Name and Visa	Checked by Name and Visa	Approved by (Product Manager) Name and Visa
06/2011	00	Julien PROD'HOMME	Jerome MAREE	Bernard Kaszynski
09/2011	01	Samuel DHENNIN	Mickaël GARNIER	Philippe Vincent

TECHNICAL DOCUMENTATION COMPOSITION

Manual	Reference
Installation	1-10-960-99
Operating	1-10-961-18
Maintenance	1-10-961-16
Spare parts	1-10-961-17

SUMMARY

Chapter	Description	Volume
1	General information	1/3
2	Technical and safety data sheets (Lubricants)	
3	Preventive maintenance	
4	Mechanical maintenance	
5	Hydraulic maintenance	2/3
6	Pneumatic maintenance	
7	Electrical maintenance	3/3
8	Air conditioning units	
9	Lifting unit	
10	Verification of welds	
11		
12		

ECL CONTACTS

Address	ECL Contacts	Name	E-mail
ECL France 100, rue Chaland 59790 Ronchin - FRANCE Phone : +33 (0)3 20 88 70 70 Fax : +33 (0)3 20 88 70 99 Email : contact@ecl.fr	Project Manager	Mr F. Pereira	frederic.pereira@ecl.fr
	Product Manager	Mr P. Vincent	philippe.vincent@ecl.fr
	Technical documentation Manager	Mr B. Kaszynski	kaszynski_b@ecl.fr
	Spare Parts Manager	Mr R. Collaudin	romuald.collaudin@ecl.fr
	After Sale Services	ecl_aftersaleservices@ecl.fr	

SUBMISSIONS REGISTER

Sub N°	Manual Revision	Sending Date	Return Date	Client Status	Complete Manual			Modified Pages		
					Paper	CD rom	FTP or E-Mail	Paper	CD rom	FTP or E-Mail
01	00	15/06/2011								
02	01	08/09/2011					1			

REVISIONS MANAGEMENT

Manual Rev.	Type *	Modified pages	Page Rev.	Observations
01	A	5.28 ; chap 10	00	Manual updated
	M	FRONT PAGE, 0-2, 0-3, 3-2, 3-3	01	
02	M	Front pages ; 0-3 ; 3-3	02	Manual updated
		4-10 ; 4-11 ; 5-2 ; 5-3 ; 5-4 ; 5-5 ; 6-1 ; 6-2 ; 6-3 ; 6-16 ; 9-0	01	
	A	9-3	00	Cables certificates added

(*) M = Modified document

C = Cancelled document

A = Added document

Note: The black squares are put to localise modifications on page for last revision.

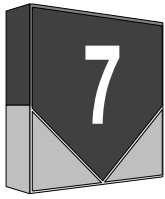
PROPRIETES INDUSTRIELLES
ET MARQUES DEPOSEES
INDUSTRIAL PROPERTIES
AND TRADEMARKS

La conception de cet équipement est la propriété de ECL et toute information le concernant dans ce document est confidentielle. Par conséquent, toute reproduction ou copie de quelque façon que ce soit de ce document et de son contenu, sans permission écrite antérieure d'ECL, est strictement interdite.

The design of this equipment is the property of ECL and all information relating to it in this document is confidential. Therefore, the reproduction or copy in any manner of this document or of the drawings and schematics herein contained without the prior written permission of ECL is strictly forbidden.

Le nom social de ECL est de propriété industrielle. Le logo ECL et les marques déposées ECL[™] et Candi[™] appartiennent à ECL et ne peuvent être employés sans permission écrite antérieure d'ECL.

ECL's corporate name is proprietary. ECL's logo and the trademarks ECL[™] and Candi[™] belong to ECL. They cannot be used without the prior written permission of ECL.



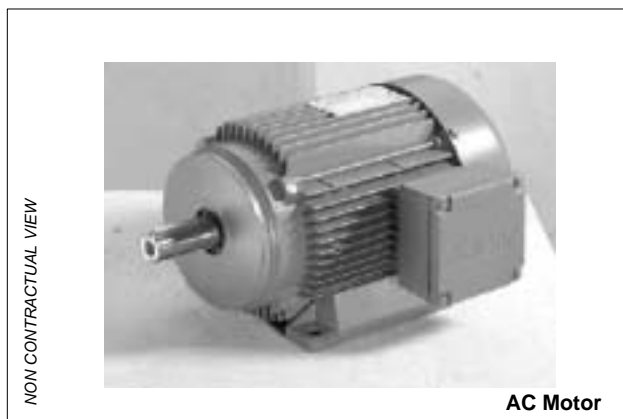
ELECTRICAL MAINTENANCE

CONTENTS OF THE CHAPTER

ELECTRIC MOTORS (SEW)	7.1-1
ELECTRIC MOTORS (LEROY-SOMER)	7.2-1
ELECTRIC MOTORS (SIEMENS)	7.3-1
BRAKE MOTORS FCR	7.4-1
BRAKE MOTORS FMD	7.5-1
COMPENSATED BRAKE ELECTRICAL SUPPLY UNIT	7.6-1
LOAD WEIGHING FOR TAPPING TROLLEY DAT 400	7.7-1
LONG TRAVEL ANTI-COLLISION SYSTEM	7.8-1
SPEED CONTROLLER FOR TAPPING TOOL LIFTING	7.9-1
INSULATOR CONTROL DEVICE	7.10-1
DYNAMOMETRIC AXLES	7.11-1
PELTIER COOLER	7.12-1
ENCODER MULTITURN AND WIRE DRAW MECHANISM	7.13-1

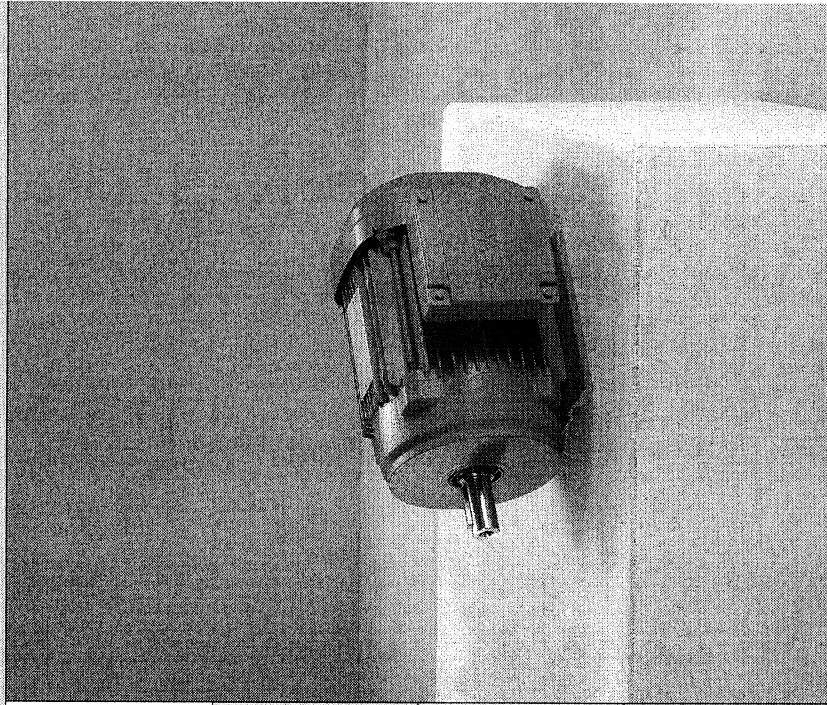
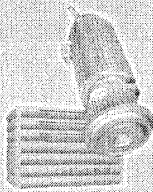
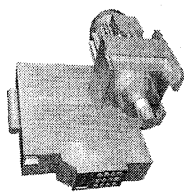
7.1 ELECTRIC MOTORS (SEW)

Location / Function	ECL Code	Reducer ref.	Motor ref.	Brake ref.	Braking Torque	Position
long travel end truck lines	1-10-868-41	KH127T / AM180	DRS180	BE20	200Nm \pm 20%	M4.Vertical
long travel end truck lines	1-10-868-42	KH127T / AM180	DRS180	BE20	200Nm \pm 20%	M4.Vertical
cross travel end truck	1-10-876-80	KH97 / A	AM132	BE11	80Nm \pm 20%	M3.Horizontal
cross travel end truck	1-10-877-45	KH97 / B	DRS132	BE11	80Nm \pm 20%	M3.Horizontal
bath pipe / hoisting ass'y	1-10-827-08	KA47	DRS90	BE1	10Nm	M1.Horizontal
To order, indicate your equipment choice (Reducer, Motor or both)						





SEW
EURODRIVE

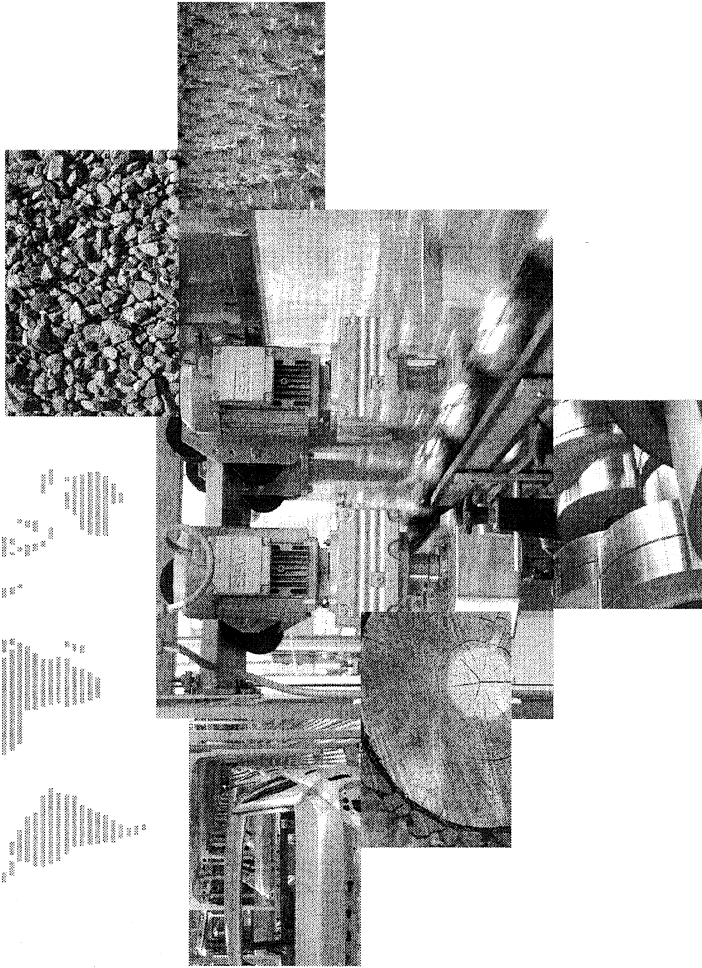


AC Motors DRS/DRE/DRP

Edition 07/2007
11651814 / EN

Operating Instructions

1. Introduction	1.1
2. Safety	2.1
3. Installation	3.1
4. Operation	4.1
5. Maintenance	5.1
6. Troubleshooting	6.1
7. Appendix	7.1
8. Index	8.1
9. Glossary	9.1
10. Symbols	10.1
11. Notes	11.1
12. Declaration of Conformity	12.1
13. Declaration of CE Marking	13.1
14. Declaration of EMC Marking	14.1
15. Declaration of Low Voltage Marking	15.1
16. Declaration of Energy Efficiency Marking	16.1
17. Declaration of RoHS Marking	17.1
18. Declaration of REACH Marking	18.1
19. Declaration of WEEE Marking	19.1
20. Declaration of GHS Marking	20.1
21. Declaration of OHSAS Marking	21.1
22. Declaration of ISO 9001 Marking	22.1
23. Declaration of ISO 14001 Marking	23.1
24. Declaration of ISO 45001 Marking	24.1
25. Declaration of ISO 50001 Marking	25.1
26. Declaration of ISO 26000 Marking	26.1
27. Declaration of ISO 27001 Marking	27.1
28. Declaration of ISO 28000 Marking	28.1
29. Declaration of ISO 31000 Marking	29.1
30. Declaration of ISO 34000 Marking	30.1
31. Declaration of ISO 35000 Marking	31.1
32. Declaration of ISO 36000 Marking	32.1
33. Declaration of ISO 37000 Marking	33.1
34. Declaration of ISO 38000 Marking	34.1
35. Declaration of ISO 39000 Marking	35.1
36. Declaration of ISO 40000 Marking	36.1
37. Declaration of ISO 41000 Marking	37.1
38. Declaration of ISO 42000 Marking	38.1
39. Declaration of ISO 43000 Marking	39.1
40. Declaration of ISO 44000 Marking	40.1
41. Declaration of ISO 45000 Marking	41.1
42. Declaration of ISO 46000 Marking	42.1
43. Declaration of ISO 47000 Marking	43.1
44. Declaration of ISO 48000 Marking	44.1
45. Declaration of ISO 49000 Marking	45.1
46. Declaration of ISO 50000 Marking	46.1
47. Declaration of ISO 51000 Marking	47.1
48. Declaration of ISO 52000 Marking	48.1
49. Declaration of ISO 53000 Marking	49.1
50. Declaration of ISO 54000 Marking	50.1
51. Declaration of ISO 55000 Marking	51.1
52. Declaration of ISO 56000 Marking	52.1
53. Declaration of ISO 57000 Marking	53.1
54. Declaration of ISO 58000 Marking	54.1
55. Declaration of ISO 59000 Marking	55.1
56. Declaration of ISO 60000 Marking	56.1
57. Declaration of ISO 61000 Marking	57.1
58. Declaration of ISO 62000 Marking	58.1
59. Declaration of ISO 63000 Marking	59.1
60. Declaration of ISO 64000 Marking	60.1
61. Declaration of ISO 65000 Marking	61.1
62. Declaration of ISO 66000 Marking	62.1
63. Declaration of ISO 67000 Marking	63.1
64. Declaration of ISO 68000 Marking	64.1
65. Declaration of ISO 69000 Marking	65.1
66. Declaration of ISO 70000 Marking	66.1
67. Declaration of ISO 71000 Marking	67.1
68. Declaration of ISO 72000 Marking	68.1
69. Declaration of ISO 73000 Marking	69.1
70. Declaration of ISO 74000 Marking	70.1
71. Declaration of ISO 75000 Marking	71.1
72. Declaration of ISO 76000 Marking	72.1
73. Declaration of ISO 77000 Marking	73.1
74. Declaration of ISO 78000 Marking	74.1
75. Declaration of ISO 79000 Marking	75.1
76. Declaration of ISO 80000 Marking	76.1
77. Declaration of ISO 81000 Marking	77.1
78. Declaration of ISO 82000 Marking	78.1
79. Declaration of ISO 83000 Marking	79.1
80. Declaration of ISO 84000 Marking	80.1
81. Declaration of ISO 85000 Marking	81.1
82. Declaration of ISO 86000 Marking	82.1
83. Declaration of ISO 87000 Marking	83.1
84. Declaration of ISO 88000 Marking	84.1
85. Declaration of ISO 89000 Marking	85.1
86. Declaration of ISO 90000 Marking	86.1
87. Declaration of ISO 91000 Marking	87.1
88. Declaration of ISO 92000 Marking	88.1
89. Declaration of ISO 93000 Marking	89.1
90. Declaration of ISO 94000 Marking	90.1
91. Declaration of ISO 95000 Marking	91.1
92. Declaration of ISO 96000 Marking	92.1
93. Declaration of ISO 97000 Marking	93.1
94. Declaration of ISO 98000 Marking	94.1
95. Declaration of ISO 99000 Marking	95.1
96. Declaration of ISO 100000 Marking	96.1
97. Declaration of ISO 101000 Marking	97.1
98. Declaration of ISO 102000 Marking	98.1
99. Declaration of ISO 103000 Marking	99.1
100. Declaration of ISO 104000 Marking	100.1



SEW
EURODRIVE

Table of Contents

Table of Contents

1	General Information	5
1.1	Structure of the safety notes.....	5
1.2	Rights to claim under limited warranty.....	5
1.3	Exclusion of liability.....	5
2	Safety Notes	6
2.1	Preliminary information.....	6
2.2	General information.....	6
2.3	Designated use.....	7
2.4	Transport.....	7
2.5	Installation.....	7
2.6	Electrical connection.....	8
2.7	Operation.....	8
3	Motor Design	9
3.1	Basic design of DR.71 – DR.132.....	9
3.2	Basic design of the DR.160.....	10
3.3	Basic design of the DR.315.....	11
3.4	Nameplate, unit designation.....	12
4	Mechanical Installation	13
4.1	Before you start.....	13
4.2	Mechanical installation.....	13
5	Electrical Installation	16
5.1	Using the wiring diagrams.....	16
5.2	Wiring notes.....	16
5.3	Special aspects for operation with a frequency inverter.....	17
5.4	Improving the grounding (EMC).....	18
5.5	Special aspects in switching operation.....	19
5.6	Ambient conditions during operation.....	19
5.7	Connecting the motor.....	20
5.8	Connecting the brake.....	25
5.9	Accessory equipment.....	26
6	Startup	29
6.1	Prerequisites for startup.....	29
7	Inspection / Maintenance	30
7.1	Inspection and maintenance intervals.....	30
7.2	Bearing lubrication.....	31
7.3	Reinforced bearing.....	32
7.4	Preliminary work for motor and brake maintenance.....	33
7.5	Inspection and maintenance work on the motor DR71-DR100.....	35
7.6	Inspection and maintenance for DR71-DR100 brake motors.....	38
7.7	Inspection and maintenance work on the DR315 motor.....	54
7.8	Inspection and maintenance for DR315 brake motor.....	57

Table of Contents

8	Technical Data	68
8.1	Work done, working air gap, braking torques.....	68
8.2	Braking torque assignment.....	69
8.3	Operating currents.....	70
8.4	Resistances.....	73
8.5	Brake rectifier combinations.....	76
8.6	Brake control.....	77
8.7	Permitted roller bearing types.....	79
8.8	Lubricant tables.....	80
8.9	Order data for lubricants and anti-corrosion agents.....	80
9	Appendix	81
9.1	Wiring diagrams.....	81
10	Malfunctions	89
10.1	Motor malfunctions.....	89
10.2	Brake malfunctions.....	91
10.3	Malfunctions when operated with a frequency inverter.....	93
10.4	Customer service.....	93
11	Address List	94
	Index	103



1 General Information

1.1 Structure of the safety notes

The safety notes in these operating instructions are designed as follows:

Pictogram	A SIGNAL WORD!
	Type and source of danger. Possible consequence(s) if the safety notes are disregarded. • Measure(s) to prevent the danger.

Pictogram	Signal word	Meaning	Consequences in case of disregard
Example: 	A DANGER!	Imminent danger	Severe or fatal injuries
	A WARNING!	Possible dangerous situation	Severe or fatal injuries
	A CAUTION!	Possible dangerous situation	Minor injuries
	STOP!	Possible damage to property	Damage to the drive system or its environment
	NOTE	Useful information or a tip Simplifies the handling of the drive system	

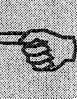
1.2 Rights to claim under limited warranty

A requirement of fault-free operation and fulfillment of any rights to claim under limited warranty is that you adhere to the information in the operating instructions. Consequently, read the operating instructions before you start working with the unit!

Make sure that the operating instructions are available to persons responsible for the plant and its operation, as well as to person who work independently on the unit. You must also ensure that the documentation is legible.

1.3 Exclusion of liability

You must comply with the information contained in these operating instructions to ensure safe operation of the electric motors and to achieve the specified product characteristics and performance requirements. SEW-EURODRIVE assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of these operating instructions. In such cases, any liability for defects is excluded.



2 Safety Notes

The following basic safety notes must be read carefully to prevent injury to persons and damage to property. The operator must make sure that the basic safety notes are read and observed. Make sure that persons responsible for the plant and its operation, as well as persons who work independently on the unit, have read through the operating instructions carefully and understood them. If you are unclear about any of the information in this documentation, please contact SEW-EURODRIVE.

2.1 Preliminary information

The following safety notes are concerned with the use of motors. If using gearmotors, please also refer to the safety notes for gear units in the corresponding operating instructions.

Also consider the supplementary safety notes in the individual sections of these operating instructions.

2.2 General information

Never install damaged products or take them into operation. Submit a complaint to the shipping company immediately in the event of damage.

Low-voltage machines have dangerous, live and rotating parts as well as hot surfaces.

All work related to transportation, putting into storage, setup/mounting, connection, start-up, maintenance and repair may only be carried out by qualified personnel observing

- The relevant detailed operating instruction(s) and wiring diagrams
 - The warning and safety signs on the motor/gearmotor
 - The specific regulations and requirements for the system
 - The national/regional regulations governing safety and the prevention of accidents
- Removing covers without authorization, improper use as well as incorrect installation or operation may result in severe injuries to persons or damage to machinery.
- Consult the documentation for additional information.





Safety Notes

Designated use

2

2.3 Designated use

The electric motors are intended for industrial systems. The use in potentially explosive atmospheres is not permitted unless the unit has been designed expressly for this purpose.

Air-cooled variants are designed for ambient temperatures of -20 °C to +40 °C and altitudes of ≤ 1,000 m above sea level. Please take into account deviating specifications on the nameplate. The conditions where the unit is used must comply with all specifications on the nameplate.

2.4 Transport

Inspect the shipment for any damage that may have occurred in transit as soon as you receive the delivery. Inform the shipping company immediately. You may need to pre-clude startup.

Tighten the eyebolts. They are only rated for the weight of the motor/gearmotor; do not attach any additional loads.

The installed lifting eyebolts are in accordance with DIN 580. The loads and regulations specified in that document must always be observed. If the gearmotor is equipped with two suspension eye lugs or lifting eyebolts, then both of the suspension eye lugs should be used for transportation. In this case, the tension force vector of the slings must not exceed a 45° angle according to DIN 580.

Use suitable, sufficiently rated handling equipment if necessary. Remove any transportation restraints prior to startup. Re-use for any further transports. When storing low-voltage machines, make sure to keep it in a dry, dust-free environment with minimum vibration ($v_{eff} \leq 0.2 \text{ mm/s}$) (damage to stalled bearings). Measure the insulation resistance before startup. Dry the winding if values $\leq 1 \text{ k}$ per volt of the rated voltage.

2.5 Installation

Make sure the feet and flanges are safely fixed and rest positively on their entire surface. Check the exact alignment with direct coupling. Avoid resonance of the base with the rotational frequency and double mains frequency. Turn the rotor by hand and listen for unusual grinding noises. Check the direction of rotation with the machine uncoupled.

Use only suitable tools to mount or pull off belt pulleys or couplings (heat) and cover with a protection against accidental contact. Avoid unadmissible tension of the belts.

Provide necessary pipe connections, if required. For vertical shaft-up designs, suitable protection must be provided at the mounting end so that no foreign matter can enter the ventilation holes. Such protection must, however, not affect the cooling and air leaving the motor – or adjacent groups – must not be drawn in again.

Observe the notes in sec. "Mechanical Installation".



Safety Notes

Electrical connection

2

2.6 Electrical connection

All work may only be carried out by qualified personnel. During work, the low-voltage machine must be at standstill in enabled condition and safeguarded against unintentional restart. This also applies to auxiliary power circuits (e.g. anti-condensation heating).

Ensure that the unit is de-energized!

Exceeding the tolerances in EN 60034-1 (VDE 0530, part1) – voltage + 5 %, frequency + 2 %, curve shape, symmetry - increases the temperature and influences electromagnetic compatibility. Observe nameplate data and the wiring diagram in the terminal box.

Note the wiring information and deviating data on the nameplate and the wiring diagram.

The supply cables must be connected with special care to ensure permanent and reliable contact (without loose cable ends); use assigned terminals for the connection cables. Ensure a safe connection of the protective earth conductor. When the motor is connected, the distances to live and uninsulated parts may not be below the minimum values specified in IEC 60664 and in national regulations. The minimum distances for low voltage according to IEC 60664 are:

Rated voltage V_R	Distance
$\leq 500 \text{ V}$	3 mm
$\leq 690 \text{ V}$	5.5 mm

Make sure that no foreign matter is left in the terminal box, and that it is clean and dry. Cable entries which are not used and the terminal box itself have to be sealed dust- and watertight. Secure keys for test mode without output elements. Check whether the brake is functioning correctly before startup when using a low voltage machine with brake.

Observe the notes in sec. "Electrical Installation"!

2.7 Operation

Whenever changes occur in relation to normal operation, such as increased temperatures, noise, oscillation, determine the cause and contact the manufacturer, if required. Never bypass or disable protection devices, not even in test mode. If you are in doubt, switch off the motor.

Regularly clean air ducts in dusty or dirty environments.

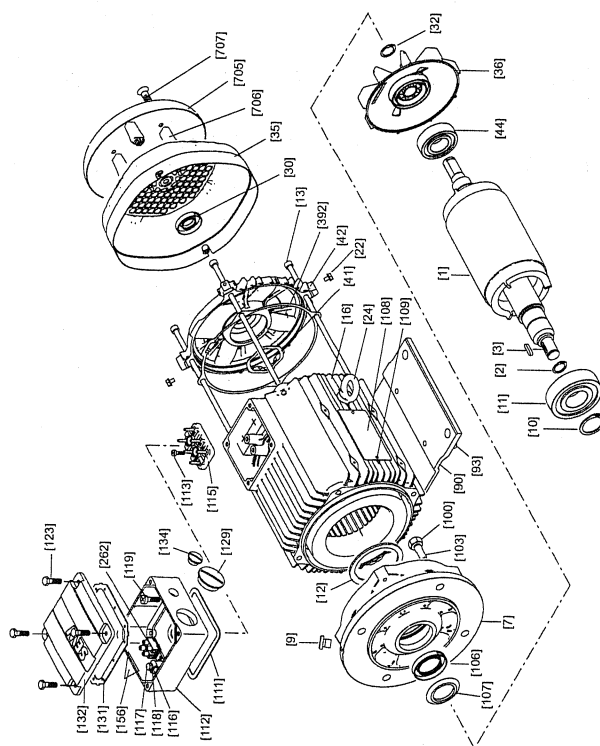
3 Motor Design

NOTE



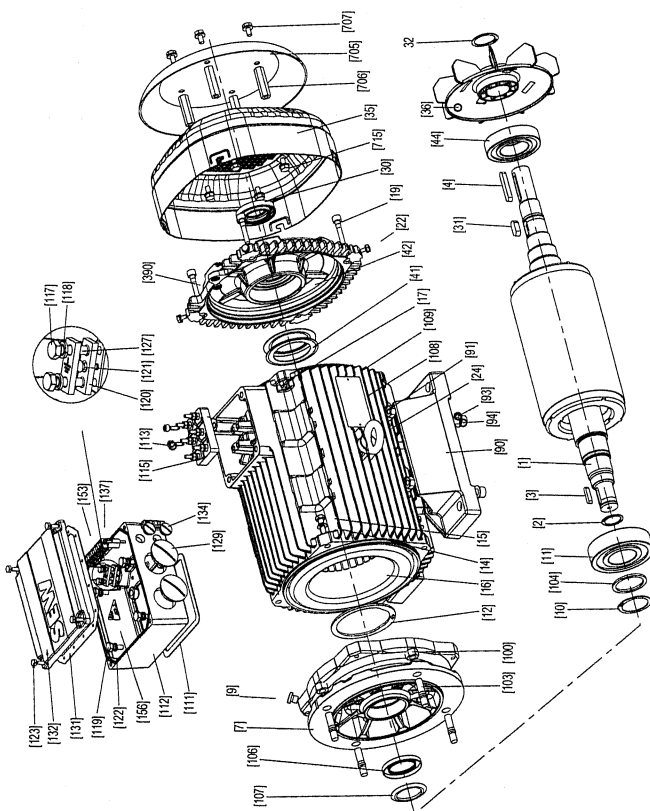
The following illustration is intended to explain the general structure. Its only purpose is to facilitate the assignment of components to the spare parts lists. Discrepancies are possible depending on the motor size and version!

3.1 Basic design of DR.71 – DR.132



- | | | | | | |
|------|--------------------------|-------|--------------------------|-------|-------------------------|
| [1] | Rotor | [41] | Equalizing ring | [117] | Hex head bolt |
| [2] | Circip | [42] | B-side endshield | [118] | Lock washer |
| [3] | Key | [44] | Deep groove ball bearing | [119] | Pan head screw |
| [7] | Flanged end shield | [90] | Base plate | [123] | Hex head bolt |
| [9] | Screw plug | [93] | Pan head screw | [129] | Screw plug with O-ring |
| [10] | Circip | [100] | Hexagonal nut | [131] | Gasket for cover |
| [11] | Deep groove ball bearing | [103] | Stud | [132] | Terminal box cover |
| [12] | Circip | [106] | Oil seal | [134] | Screw plug with O-ring |
| [13] | Machine screw | [107] | Oil-finger ring | [158] | Information sign |
| [16] | Stator | [108] | Nameplate | [262] | Terminal clip, complete |
| [22] | Hex head bolt | [109] | Grooved pin | [392] | Gasket |
| [24] | Lifting eyebolt | [111] | Seal for bottom part | [705] | Protection canopy |
| [30] | Oil seal | [112] | Terminal box lower part | [706] | Spacer |
| [32] | Circip | [113] | Pan head screw | [707] | Pan head screw |
| [39] | Pan guard | [115] | Terminal board | | |
| [98] | Fan | [116] | Terminal clip | | |

3.2 Basic design of the DR.160



- | | | | |
|-------|------------------------------|-------|---------------------------|
| [39] | Fan | [119] | Hex head bolt |
| [41] | Spring washer | [120] | Grounding terminal bottom |
| [42] | Non drive-end bearing shield | [121] | Grooved pin |
| [44] | Deep groove ball bearing | [122] | Lock washer |
| [90] | Foot | [123] | Hex head bolt |
| [91] | Hexagonal nut | [127] | Grounding terminal top |
| [93] | Disc | [129] | Screw plug with O-ring |
| [94] | Machine screw | [131] | Gasket for cover |
| [100] | Hexagonal nut | [132] | Terminal box cover |
| [103] | Stud | [134] | Screw plug with O-ring |
| [106] | Oil seal | [137] | Bolt |
| [107] | Oil-finger ring | [153] | Terminal strip, complete |
| [108] | Nameplate | [156] | Information sign |
| [109] | Grooved pin | [390] | O-ring |
| [111] | Seal for bottom part | [705] | Protection canopy |
| [112] | Terminal box lower part | [706] | Spacer |
| [113] | Bolt | [707] | Hex head bolt |
| [115] | Terminal board | [715] | Hex head screw |
| [117] | Hex head bolt | [718] | Lock washer |
| [118] | Lock washer | | |

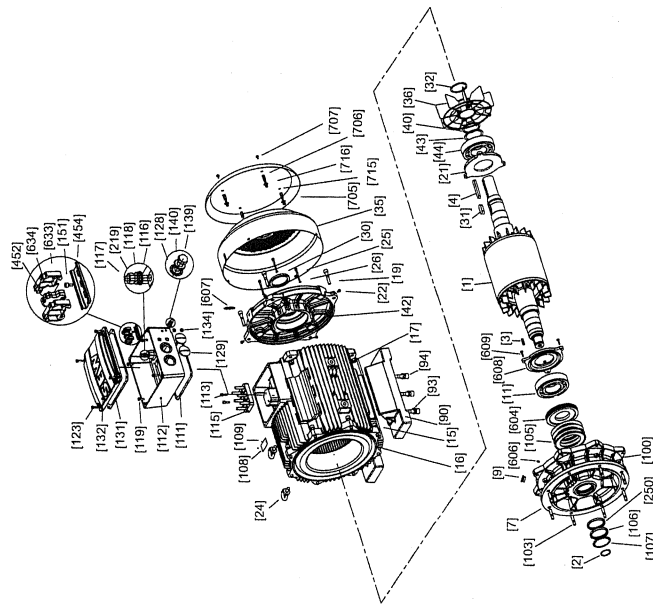


Motor Design

Basic design of the DR.315

3

3.3 Basic design of the DR.315



- [1] Rotor
- [2] Circlip
- [3] Key
- [4] Key
- [7] Flange
- [9] Screw plug
- [11] Rolling element bearings
- [15] Machine screw
- [16] Stator
- [17] Hexagonal nut
- [19] Machine screw
- [21] Oil seal flange
- [22] Hex head bolt
- [24] Jitting eyebolt
- [25] Machine screw
- [26] Sealing washer
- [30] Oil seal
- [31] Key
- [32] Circlip
- [35] Fan guard
- [36] Fan
- [40] Circlip
- [42] Non drive-end bearing shield

- [43] Supporting ring
- [44] Rolling element bearings
- [90] Foot
- [93] Disc
- [94] Machine screw
- [100] Hex nut
- [103] Stud
- [105] Spring washer
- [106] Oil seal
- [107] Oil flinger
- [108] Nameplate
- [109] Grooved pin
- [111] Gasket for lower part
- [112] Terminal box lower part
- [113] Machine screw
- [115] Terminal board
- [116] Serrated lock washer
- [117] Stud
- [118] Washer
- [119] Hex head screw
- [123] Hex head screw
- [128] Serrated lock washer
- [129] Screw plug

351998603



Motor Design

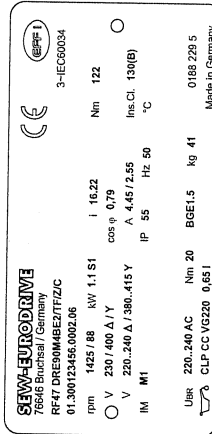
Nameplate, unit designation

3

3.4 Nameplate, unit designation

3.4.1 Nameplate

Example: DRE
gearmotor with
brake

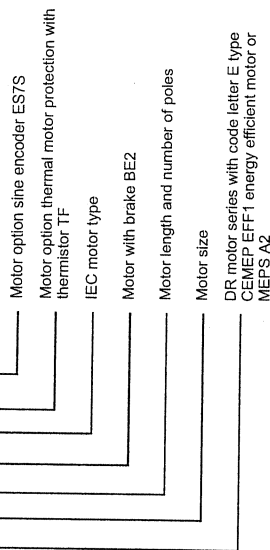


186018187

3.4.2 Unit designation

Example: AC
motor with feet and
brake

DRE 90 M4 BE2 /F1 /TF /ES7S



DR motor series with code letter E type
CEMEP EFF1 energy efficient motor or
MEPS A2






Mechanical Installation Before you start

4


4 Mechanical Installation

	NOTE
It is essential to observe the safety notes in section 2 during installation.	

4.1 Before you start

The drive may only be installed when

- The entries on the nameplate of the drive and/or the output voltage of the frequency inverter match the voltage supply system
- The drive is undamaged (no damage caused by transportation or storage).
- It is certain that the following requirements have been met:
 - Ambient temperature between -20 °C and 40 °C ¹⁾
 - No oil, acid, gas, vapors, radiation, etc.
 - Installation altitude max. 1000 m above sea level.
 - Note the restrictions for encoders
 - Special versions: Drive configured in accordance with the ambient conditions.


	STOP
Make sure the mounting position corresponds to the information on the nameplate!	

4.2 Mechanical installation

4.2.1 Preliminary work

Motor shaft ends must be thoroughly cleaned of anti-corrosion agents, contamination or similar (use a commercially available solvent). Do not allow the solvent to penetrate the bearings or shaft seals – this could damage the material.

Motors with reinforced bearing

	STOP
Motors with reinforced bearing may not be operated without any overhung loads. The bearings might be damaged.	

1) Note that the temperature range of the gear unit may also be restricted (see gear unit operating instructions).



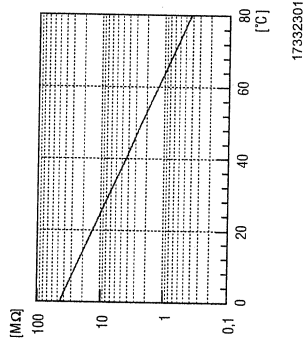
Mechanical Installation Mechanical installation

4

Long-term storage
of motors

- Please note that the grease utilization period of the ball bearings is reduced by 10 % each year after storage periods exceeding one year.
- Re-lubricate motors with relubrication device that have been stored longer than 5 years before startup. Observe the information on the lubrication plate of the motor.
- Check whether the motor has absorbed moisture as a result of being stored for a long time. Measure the insulation resistance for this purpose (measuring voltage 500 V).

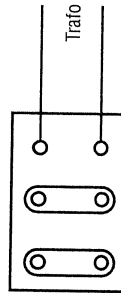
The insulation resistance (see following figure) varies greatly depending on the temperature. The motor must be dried if the insulation resistance is not adequate.



Drying the motor

Heat the motor:

- With hot air or
- Via isolation transformer
 - Connect the windings in series (see following figure)
 - Auxiliary AC voltage supply max. 10 % of the rated voltage with max. 20 % of the rated current



174065419

The drying process is finished when the minimum insulation resistance has been exceeded.

Check terminal box whether:

- The inside is clean and dry
- The connections and fixing parts are free from corrosion
- Seals and sealing surfaces are ok
- The cable glands are sound, otherwise clean or replace them.

Mechanical Installation



4

4.2.2 Installing the motor

The motor or gearmotor may only be mounted or installed in the specified mounting position on a level and torsionally rigid support structure that is not subject to shocks.

Carefully align the motor and the driven machine to avoid placing any unacceptable strain on the output shafts (observe permitted overhung load and axial load).

Do not butt or hammer the shaft end.

Use an appropriate cover to protect motors in vertical mounting positions from objects or fluids entering (protection cowl C).

Ensure an unobstructed cooling air supply and that air heated by other apparatus cannot be drawn in or reused.

Balance components for subsequent mounting on the shaft with a half key (motor shafts are balanced with a half key).

Existing condensation drain holes are sealed with closing plugs. Drain holes can be opened if required to drain the condensation but have to be closed again because open drain holes make higher protection ratings ineffective.

If using brake motors with manual brake release, screw in either the hand lever (with self-reengaging manual brake release) or the setscrew (with lockable manual brake release).

Installation in damp locations or in the open

If possible, arrange the terminal box so that the cable entries are pointing downwards. Coat the threads of cable glands and filler plugs with sealing compound and tighten them well — then coat them again.

Seal the cable entry well.

Clean the sealing surfaces of the terminal box and the terminal box cover carefully before re-assembly; gaskets have to be glued in on one side. Replace brittle gaskets.

Restore the anticorrosive coating if necessary.

Check the degree of protection.

4.2.3 Installation tolerances

Shaft end	Flanges
Diameter tolerance according to EN 50347	Centering shoulder tolerance according to EN 50347
<ul style="list-style-type: none">• ISO j6 with $\varnothing \leq 28$ mm• ISO k6 with $\varnothing \geq 38$ mm up to ≤ 48 mm• ISO m6 for $\varnothing \geq 55$ mm• Center bore in accordance with DIN 332, shape DR...	<ul style="list-style-type: none">• ISO j6 with $\varnothing \leq 250$ mm• ISO h6 for $\varnothing \geq 300$ mm

Electrical Installation



5

5 Electrical Installation

NOTES

- It is essential to observe the safety notes in section 2 during installation.
- Switch contacts in utilization category AC-3 to EN 60947-4-1 must be used for switching the motor and the brake.



5.1 Using the wiring diagrams

Connect the motor only as shown in the wiring diagram(s) included with the motor. **Do not connect or start up the motor if the wiring diagram is missing.** You can obtain the valid wiring diagrams free of charge from SEW-EURODRIVE.

5.2 Wiring notes

Comply with the safety notes during startup.

5.2.1 Protection against interference from brake control systems

Brake cables must always be routed separately from other power cables with phased currents unless they are shielded to protect brake control systems against interference. Power cables with phased currents are in particular

- Output cables from frequency inverters and servo controllers, soft start units and brake units
- Supply cables for brake resistors and similar options

5.2.2 Protecting motor protection devices against interference

To protect SEW motor protection devices (TF temperature sensors, TH winding thermostats) against interference:

- Route separately shielded supply cables together with switched-mode power lines in one cable.
- Do not route unshielded supply cables together with switched-mode power lines in one cable.



Electrical Installation

Special aspects for operation with a frequency inverter

5

5.3 Special aspects for operation with a frequency inverter

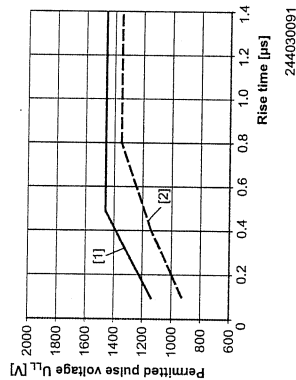
When motors are powered from inverters, you must adhere to the wiring instructions issued by the inverter manufacturer. It is essential to observe the operating instructions for the frequency inverter.

5.3.1 Motor on SEW inverter

SEW-EURODRIVE has tested operation of the motor on SEW frequency inverters. The required dielectric strength values of the motors were confirmed and the startup routines adjusted to the motor data. You can operate the DR motor with any frequency inverter from SEW-EURODRIVE. To do so, startup the motor according to the operating instructions of the frequency inverter.

5.3.2 Motor on non-SEW frequency inverter

Operation of SEW motors on non-SEW frequency inverters is permitted if the pulse voltages indicated in the following figure are not exceeded for the specified rise times.



[1] Permitted pulse voltage for DR standard

[2] Permitted pulse voltage according to IEC 60 034-17



NOTE

The diagram applies to motor operation. If the permitted pulse voltage is exceeded, limiting measures such as filters, chokes or special motor cables have to be used. Ask the manufacturer of the frequency inverter in this case.



Electrical Installation

Improving the grounding (EMC)

5

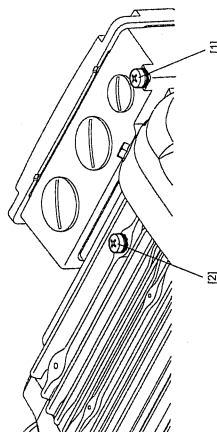
5.4 Improving the grounding (EMC)

For improved, low-impedance grounding at high frequencies, we recommend using the following connections:

5.4.1 Size DR.71-DR.132:

Size DR.71-DR.132

- 1 x self-lapping screw DIN 7500 M5 x 12
- 1 x disk ISO 7090
- 1 x serrated lock washer DIN 6798



176658571

[1] Use the pre-cast bore at the terminal box (brake motor)

[2] Bore in stator housing with $\varnothing = 4.6$ and $l_{\max} = 11.5$

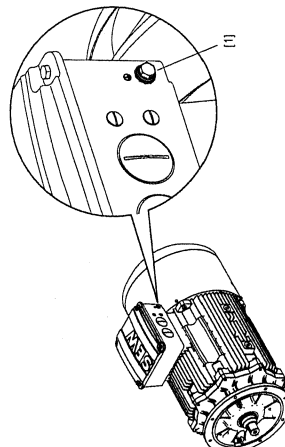
5.4.2 Size DR.160-DR.315:

Size DR.160

- 1 x hex head screw ISO 4017 M8 x 20
- 1 x disk ISO 7090
- 1 x serrated lock washer DIN 6798

Size DR.315

- 1 x hex head screw ISO 4017 M12 x 30
- 1 x disk ISO 7090
- 1 x serrated lock washer DIN 6798



370040459

[1] Using the grounding screw on the terminal box

5.5 Special aspects in switching operation

When the motors are used in switching operation, possible interference of the switch-gear must be excluded by ensuring suitable wiring. According to EN 60204 (electrical equipment of machines), motor windings must have interference suppression to protect the numerical or programmable logic controllers. As it is primarily switching operations that cause interference, SEW-EURODRIVE recommends installing protective circuitry in the switching devices.

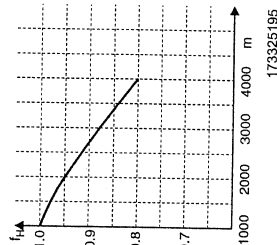
5.6 Ambient conditions during operation

5.6.1 Ambient temperature

The temperature range of -20 °C to 40 °C must be ensured unless specified otherwise on the nameplate. Motors intended for use in higher or lower ambient temperatures have the appropriate designation on the nameplate.

5.6.2 Installation altitude

The maximum installation altitude of 1,000 m above sea level must not be exceeded. Otherwise, power is reduced by the factor f_H according to the diagram below.



The reduced rated power is calculated according to the following formula:

$$P_{M1} = P_N \times f_H$$

P_{M1} = Reduced rated power [kW]

P_N = Rated power [kW]

f_H = Factor for reduction due to installation altitude

5.6.3 Hazardous radiation

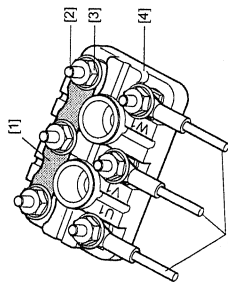
Motors must not be subjected to hazardous radiation (such as ionizing radiation). Contact SEW-EURODRIVE if necessary.

5.7 Connecting the motor

5.7.1 Connecting the motor via terminal box

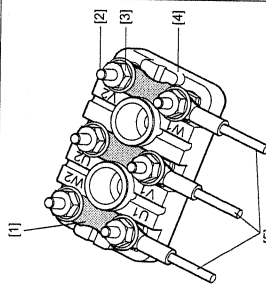
- According to the circuit diagram provided
- Check cable cross section
- Arrange terminal links correctly
- Tighten connections and protective earth
- In the terminal box: Check winding connections and tighten them if necessary

Layout of the terminal links for Δ connection

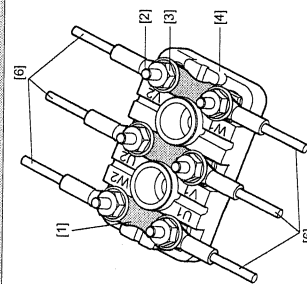


Layout of the terminal links for Δ connection

Motor size DR 71-DR 160:



Motor size DR 315:



- (1) Terminal link
- (2) Terminal stud
- (3) Hexagon nut with flange
- (4) Terminal board
- (5) Customer connection
- (6) Customer connection with split connection cable

NOTE

The terminal box must be free of foreign objects, dirt and humidity. Unused cable entry openings and the terminal box itself must be closed so they are dust and water proof.



Electrical Installation

Connecting the motor

5

5.7.2 Motor connection terminal board

Depending on the electric design, the motors are supplied and connected in different ways. The terminal links must be arranged according to the wiring diagram and screwed in tightly. Observe the tightening torques specified in the following tables

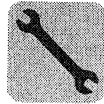
Motor size DR.71-DR.100				
Terminal stud diameter	Tightening torque of hex nut	Connection at customer site cross section	Version	Scope of delivery
M4	1.6 Nm	$\leq 1.5 \text{ mm}^2$	Type 1a	Pre-assembled terminal links
			Type 1b	Pre-assembled terminal links
		$\leq 6 \text{ mm}^2$	Type 2	Small connection accessories in enclosed bag
M5	2.0 Nm	$\leq 10 \text{ mm}^2$	Type 2	Small connection accessories in enclosed bag
		$\leq 16 \text{ mm}^2$	Type 3	Small connection accessories in enclosed bag
M6	3.0 Nm			

Motor size DR.112-DR.132				
Terminal stud diameter	Tightening torque of hex nut	Connection at customer site cross section	Version	Scope of delivery
M5	2.0 Nm	$\leq 10 \text{ mm}^2$	Type 2	Connection accessories pre-assembled
		$\leq 16 \text{ mm}^2$	Type 3	Connection accessories pre-assembled
M6	3.0 Nm			

Motor size DR.160				
Terminal stud diameter	Tightening torque of hex nut	Connection at customer site cross section	Version	Scope of delivery
M6	3.0 Nm	$\leq 16 \text{ mm}^2$	Type 3	Connection accessories pre-assembled
		$\leq 25 \text{ mm}^2$	Type 3	Connection accessories pre-assembled
M8	6.0 Nm			

Motor size DR.315				
Terminal stud diameter	Tightening torque of hex nut	Connection at customer site cross section	Version	Scope of delivery
M12	15.5 Nm	$\leq 50 \text{ mm}^2$	Type 3	Connection accessories pre-assembled
		$\leq 95 \text{ mm}^2$		
M16	30 Nm			

The types printed in bold apply to S1 operation for the standard voltages and standard frequencies according to the data specified in the catalog. Deviating types can have different connections, e.g. different diameters of the terminal studs, and / or a different scope of delivery.



Electrical Installation

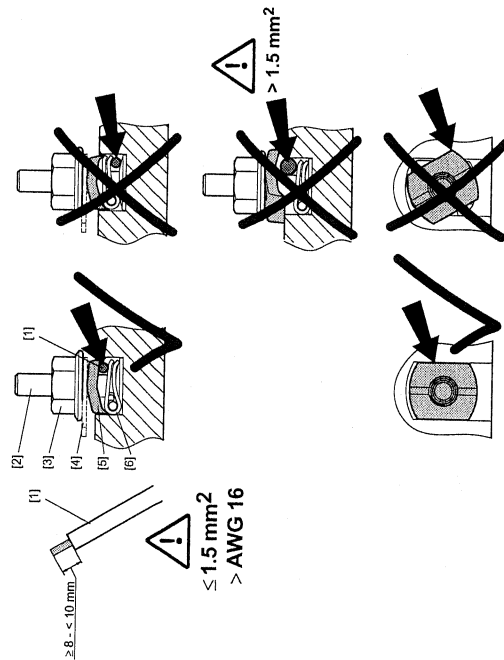
Connecting the motor

5

Type 1

- If the cross section of the external connection is $\leq 1.5 \text{ mm}^2$, it can be installed directly under the terminal washer.
- If the cross section of the external connection is $> 1.5 \text{ mm}^2$, it must be installed as cable lug under the terminal washer.

Type 1a: Cross section $\leq 1.5 \text{ mm}^2$



[1] External connection with cross section $\leq 1.5 \text{ mm}^2$

[2] Terminal stud

[3] Hexagon nut with flange

[4] Terminal link

[5] Terminal washer

[6] Winding connection with Stocko connection terminal

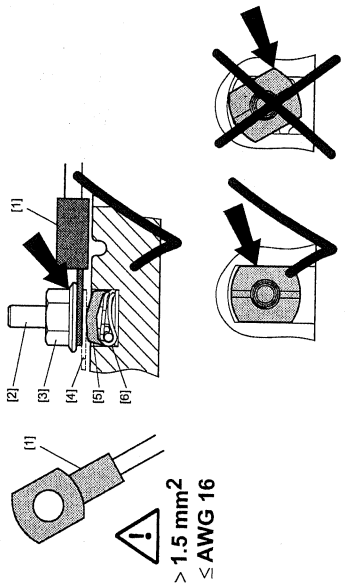
88866955



5

Electrical Installation Connecting the motor

Type 1b: Cross section $> 1.5 \text{ mm}^2$

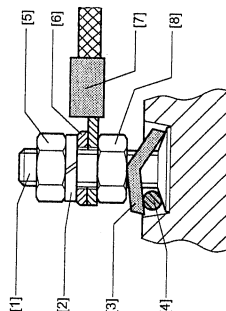


$> 1.5 \text{ mm}^2$
 $\leq \text{AWG } 16$

88864779

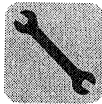
- [1] External connection with ring cable lug, for example according to DIN 46237 or DIN 46234
- [2] Terminal stud
- [3] Hexagon nut with flange
- [4] Terminal link
- [5] Terminal washer
- [6] Winding connection with Stocko connection terminal

Type 2



185438371

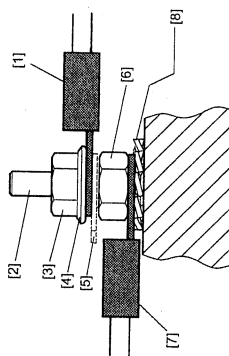
- [1] Terminal stud
- [2] Lock washer
- [3] Terminal washer
- [4] Winding connection
- [5] Upper nut
- [6] Washer
- [7] External connection with ring cable lug, for example according to DIN 46237 or DIN 46234
- [8] Lower nut



5

Electrical Installation Connecting the motor

Type 3




199641099

- [1] External connection with ring cable lug, for example according to DIN 4637 or DIN 46234
- [2] Terminal stud
- [3] Upper nut
- [4] Washer
- [5] Terminal link
- [6] Lower nut
- [7] Winding connection with ring cable lug
- [8] Serrated lock washer

5.8 Connecting the brake

The brake is released electrically. The brake is applied mechanically when the voltage is switched off.



STOP

- Comply with the applicable regulations issued by the relevant employer's liability insurance association regarding phase failure protection and the associated circuit / circuit modification.
- Connect the brake according to the wiring diagram supplied with the brake.
- In view of the DC voltage to be switched and the high level of current load, it is essential to use either special brake contactors or AC contactors with contacts in utilization category AC-3 to EN 60947-4-1.

5.8.1 Connecting the brake control


The DC disk brake is powered from a brake control system with protection circuit. It is located in the terminal box / IS lower part or must be installed in the control cabinet.

- Check the cable cross sections – braking currents (see sec. "Technical Data")
- Connect the brake control system according to the wiring diagram supplied with the brake
- For motors in thermal class 180 (H), install the brake rectifier in the control cabinet

5.9 Accessory equipment

Connect the accessory equipment only as shown in the wiring diagram(s) included with the motor. **Do not connect or start up the accessory equipment if the wiring diagram is missing.** You can obtain the valid wiring diagrams free of charge from SEW-EURODRIVE.

5.9.1 TF temperature sensor



STOP

Do not connect any voltages > 30 V to the TF temperature sensor!

The positive temperature coefficient (PTC) thermistors comply with DIN 44082.
Resistance measurement (measuring instrument with $V \leq 2.5\text{ V}$ or $I < 1\text{ mA}$):

- Standard measured values: 20...500 Ω , thermal resistance > 4,000 Ω

When using the temperature sensor for thermal monitoring, the evaluation function must be activated to maintain reliable isolation of the temperature sensor circuit. If the temperature reaches an excessive level, the thermal protection function must be effective immediately.

5.9.2 TH winding thermostats

The thermostats are connected in series and open when the permitted winding temperature is exceeded. They can be connected in the drive monitoring loop.

	AC V		DC V	
Voltage U [V]	250	60	24	
Current (cos $\varphi = 1.0$) [A]	2.5	1.0	1.6	
Current (cos $\varphi = 0.6$) [A]	1.6			
Contact resistance max. 1 ohm at DC 5 V / 1 mA				



5.9.3 V forced cooling fan

- Connection in separate terminal box
- Max. connection cross section $3 \times 1.5 \text{ mm}^2$
- Cable gland M16 \times 1.5

Motor size	Operating mode / connection	Frequency in Hz	Voltage V
DR.71-DR.160	1 - AC (Δ)	50	230 - 277
DR.71-DR.160	1 - AC (Δ)	60	230 - 277
DR.71-DR.315	3 - AC Y	50	346 - 500
DR.71-DR.315	3 - AC Y	60	380 - 575
DR.71-DR.315	3 - AC Δ	50	200 - 290
DR.71-DR.315	3 - AC Δ	60	220 - 330

NOTE



For information on how to connect the V forced cooling fan, refer to the wiring diagram (page 88).



5.9.4 Encoder overview

For notes on connecting the incremental encoders, please refer to the wiring diagrams:

Encoder	Motor size	Encoder type	Installation type	Power supply	Signal	Wiring diagram
ES7S	DR.71-DR.132	Encoder	Shaft centered	DC 7...30 V	1 V _{ss} sin/cos	68 169 xx 06 1)
ES7H	DR.71-DR.132	Encoder	Shaft centered	DC 7.0-12 V	Hiperface® Single-turn	68 170 xx 06 1)
AS7H	DR.71-DR.132	Encoder	Shaft centered	DC 7.0-12 V	Hiperface® Multi-turn	68 170 xx 06 1)
EH7S	DR.315	Encoder	Shaft centered	DC 10...30 V	1 V _{ss} sin/cos	08 259 xx 07 1)
AH7Y	DR.315	Encoder	Shaft centered	DC 9...30 V	TTL +SSI (RS 422)	08 259 xx 07 1)

1) xx = Placeholder for wiring diagram version

NOTES

- Maximum oscillation load for encoders $\leq 10 \text{ g} = 100 \text{ m/s}^2$ (10 Hz ... 2 kHz)
- Shock resistance $\leq 100 \text{ g} = 1,000 \text{ m/s}^2$ for DR.71-DR.132
- Shock resistance $\leq 200 \text{ g} = 2,000 \text{ m/s}^2$ for the DR.315



5.9.5 Encoder connection

When connecting encoders to inverters, always follow the operating instructions for the relevant inverter.

- Maximum line length (inverter - encoder):
 - 100 m with a capacitance per unit length $\leq 120 \text{ nF/km}$
- Core cross section: $0.20 \dots 0.5 \text{ mm}^2$
- Use shielded cable with twisted pair conductors and apply shield over large area on both ends :
 - To the connection cover of the encoder, in the cable gland, or in the encoder plug
 - To the inverter on the electronics shield clamp or to the housing of the sub D plug
- Install the encoder cables separately from the power cables, maintaining a distance of at least 200 mm.




6 Startup

Prerequisites for startup

6

6 Startup

6.1 Prerequisites for startup


	NOTE
	<ul style="list-style-type: none">• It is essential to observe the safety notes in section 2 (page 6) during installation.• In case of problems, refer to the section "Malfunctions" (page 89).

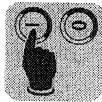
6.1.1 Before startup, make sure that:

- The drive is undamaged and not blocked.
- The measures stipulated in section "Preliminary work" (page 13) are performed after extended storage periods.
- All connections have been made properly.
- The direction of rotation of the motor/gearmotor is correct.
 - (motor rotating clockwise: U, V, W to L1, L2, L3)
- All protective covers have been installed correctly.
- All motor protection equipment is active and set for the rated motor current.
- There are no other sources of danger present.

6.1.2 During startup, make sure that:

- The motor is running correctly (no overload, no speed fluctuation, no loud noises, etc.).
- The correct braking torque is set according to the specific application (see section "Technical Data" (page 68)).

	STOP
	On brake motors with self-reengaging manual brake release, the lever must be removed after startup! A bracket is provided for storing the lever on the outside of the motor.






7 Inspection / Maintenance

Inspection and maintenance intervals

7

7 Inspection / Maintenance

	A DANGER!	<p>Risk of crushing if the hoist falls. Severe or fatal injuries.</p> <ul style="list-style-type: none">• Secure or lower hoist drives (danger of falling)• Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional re-start!• Use only genuine spare parts according to the valid parts list.• Always install a new brake controller at the same time as replacing the brake coil.
	A CAUTION!	<p>The drive surfaces can reach high temperatures during operation. Danger of burns.</p> <ul style="list-style-type: none">• Before starting work, let the motor cool down.
	STOP	<p>For assembly, the ambient temperature and the oil seals themselves may not be colder than 0°C, since the oil seals could be damaged otherwise.</p>

7.1 Inspection and maintenance intervals

Unit / unit part	Time interval	What to do?
Brake BE	• If used as a working brake: At least every 3,000 hours of operation ¹⁾	Inspect the brake <ul style="list-style-type: none">• Measure brake disc thickness• Brake disc, lining• Measure and set working air gap• Pressure plate• Carrier / gearing• Pressure rings• Vacuum up the abraded matter• Inspect the switch elements and change if necessary (e.g. in case of burn-out)
	• If used as a holding brake: Every 2 to 4 years, depending on operating conditions ¹⁾	
Motor	• Every 10,000 hours of operation ²⁾	Inspect the motor: <ul style="list-style-type: none">• Check anti-friction bearings and replace if necessary• Replace the oil seal• Clean cooling air passages
Drive	• Varies (depending on external factors)	• Repair or renew surface / anticorrosion coating

- 1) The amount of wear is affected by many factors and the service life may be short. The machine designer must calculate the required inspection/maintenance intervals individually in accordance with the project planning documents (e.g. "Project Planning for Drives").
- 2) For the DR.315 with relubrication device, please note the shortened relubrication periods in sec. "Bearing lubrication DR.315".



Inspection / Maintenance

Bearing lubrication

7

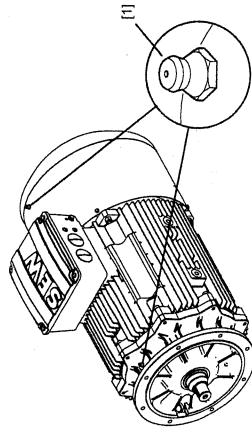
7.2 Bearing lubrication

7.2.1 Bearing lubrication of DR.71-DR.160

The motor bearings are equipped with lifetime lubrication as standard.

7.2.2 Bearing lubrication of the DR.315

Motors of size 315 can be equipped with a relubrication device. The following figure shows the location of the relubrication devices:



375353099

(1) Relubrication device in form A to DIN 71412

For normal operating conditions and an ambient temperature from -20° C to 40° C, SEW-EURODRIVE uses a mineral high-performance grease on poly-urea basis, ESSO Polyrex EM (K2P-20 DIN51825), for the first grease filling.

For motors in the low temperature range down to -40° C, SKF GXN grease is used, another mineral grease on poly-urea basis.

Relubrication

The grease can be ordered in 400 g cartridges as individual part from SEW-EURODRIVE. For order details, refer to sec. "Lubricant tables for anti-friction bearings of SEW motors" (page 80).



NOTE

Only mix greases of the same thickening agent, same oil stock and same consistency (NLGI class)!

Grease the motor bearings according to the information on the lubrication plate of the motor. The used grease accumulates in the inside of the motor. It should be removed after 6-8 relubrication cycles within the context of an inspection. When replacing the grease in the bearings, make sure that the bearing is filled two thirds roughly.

After relubrication, start up the motors slowly if possible to distribute the grease evenly.



Inspection / Maintenance

Reinforced bearing

7

Relubrication period

The relubrication period of the bearings for

- -20°C...40°C ambient temperature
- 4-pole speed
- and normal load

can be determined from the table below. Higher speeds, loads or ambient temperatures cause shorter relubrication periods.

Motor type	Horizontal mounting position		Vertical mounting position	
	Duration	Quantity	Duration	Quantity
DR.315 /NS	5,000 h	50 g	3,000 h	70 g
DR.315 /ERF /NS	3,000 h	50 g	2,000 h	70 g

7.3 Reinforced bearing

STOP



In option /ERF (reinforced bearing), cylindrical roller bearings are used on the A-side. Do not operate them without any overhung loads, since otherwise they might be damaged.

The reinforced bearing is only offered with option /NS (relubrication) to optimize lubrication of the bearings. Please observe the notes on bearing lubrication in sec. "Bearing lubrication of the DR.315" (page 31).

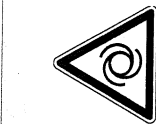


Inspection / Maintenance

Preliminary work for motor and brake maintenance

7

7.4 Preliminary work for motor and brake maintenance



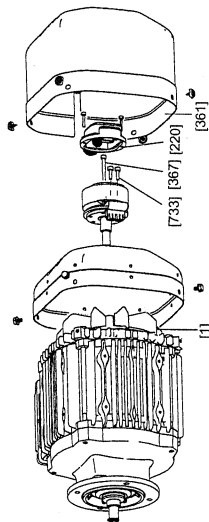
! DANGER!

Risk of crushing if the drive starts up unintentionally.

- Severe or fatal injuries.
- Before starting work, isolate the motor and brake from the power supply.
- Safeguard them against unintentional power-up.

7.4.1 Removing the incremental encoder from DR.71-DR.132

The following figure shows how to remove an encoder using the ES7 incremental encoder as example.



- [1] Rotor
- [220] Connection cover
- [361] Protective cowl
- [367] Retaining bolt
- [733] Screws

179980299

Removing AS7.

- Remove the protective cowl [361].
- Remove expansion anchor from the cowl grid by unscrewing the screws [733].
- Unscrew the central retaining screw [367] by about two to three turns and loosen the spread shaft by tapping lightly on the head of the screw.
- Remove the incremental encoder from the bore of the rotor [1].

Removing ES7.

- Remove the protective cowl [361].
- Unscrew the connection cover [220] and remove it. The encoder connection cable need not be disconnected.
- Remove expansion anchor from the cowl grid by unscrewing the screws [733].
- Unscrew the central retaining screw [367] by about two to three turns and loosen the spread shaft by tapping lightly on the head of the screw.
- Remove the incremental encoder from the bore of the rotor [1].

Re-assembly

Important for re-assembly:

- Apply NOCO® fluid to the encoder spigot.
- Tighten the central retaining screw [367] with a tightening torque of to 2.9 Nm.
- Tighten screw [733] in expansion anchor with a tightening torque of max. -1.0 Nm.



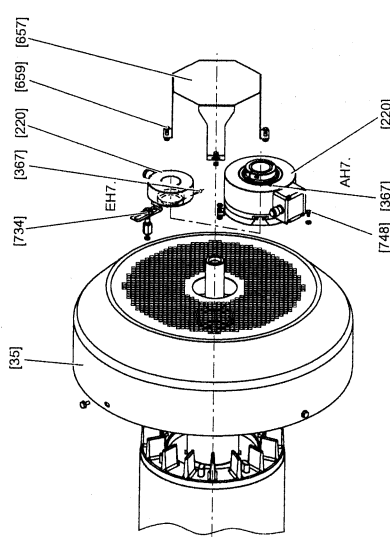
Inspection / Maintenance

Preliminary work for motor and brake maintenance

7

7.4.2 Removing incremental encoder from DR.315

The following figure shows the disassembly of the incremental encoder on the DR.315



407629451

- [35] Fan guard
- [220] Encoder
- [367] Retaining bolt
- [657] Protective cowl
- [659] Screw
- [734] Nut
- [748] Screw

Removing EH7.

- Remove protective cowl [657] by unscrewing the screws [659].
- Remove encoder from the fan guard by unscrewing the nut [734].
- Loosen retaining screw [367] on the encoder [220] and remove [220] encoder from the shaft.

Removing AH7.

- Remove protective cowl [657] by unscrewing the screws [659].
- Remove encoder from the fan guard by unscrewing the screws [748].
- Loosen retaining screw [367] on the encoder [220] and remove [220] encoder from the shaft.

Re-assembly

Important for re-assembly:

- Apply NOCO® fluid to the encoder spigot.
- Tighten retaining screw with the following tightening torques:

Encoder	Tightening torque
EH7.	0.7 Nm
AH7.	3.0 Nm



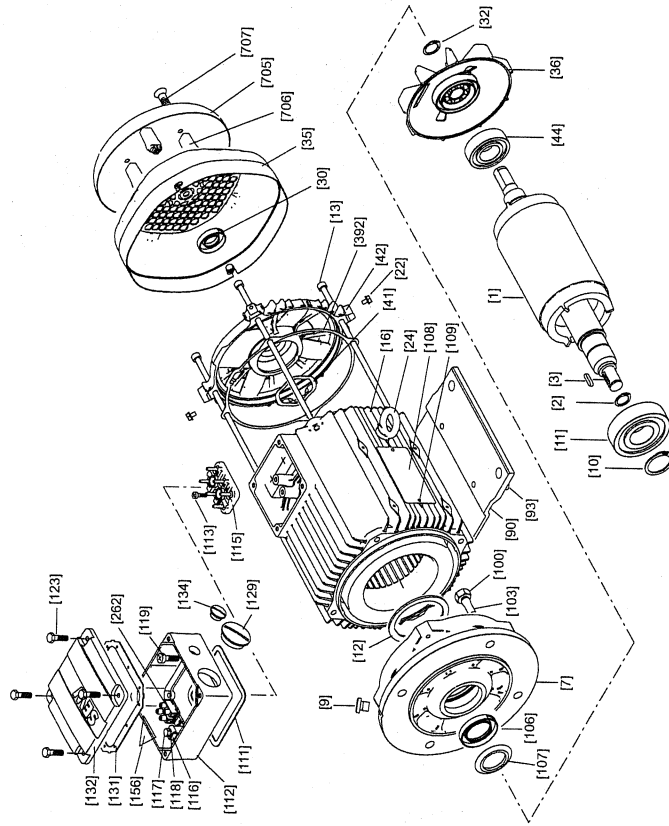
7 Inspection / Maintenance

Inspection and maintenance work on the motor DR71-DR100

7

7.5 Inspection and maintenance work on the motor DR71-DR100

7.5.1 Basic design of DR.71-DR.132



173332747

- | | | |
|-------------------------------|-----------------------------------|-------------------------------|
| [1] Rotor | [41] Equalizing ring | [117] Hex head bolt |
| [2] Circclip | [42] Non drive-end bearing shield | [118] Lock washer |
| [3] Key | [44] Grooved ball bearing | [119] Pan head screw |
| [7] Flanged end shield | [90] Base plate | [123] Hex head bolt |
| [9] Screw plug | [93] Pan head screw | [129] Screw plug with O-ring |
| [10] Circclip | [100] Hex nut | [131] Gasket for cover |
| [11] Deep groove ball bearing | [103] Stud | [132] Terminal box cover |
| [12] Circclip | [106] Oil seal | [134] Screw plug with O-ring |
| [13] Machine screw | [107] Oil flinger | [156] Information sign |
| [16] Stator | [108] Nameplate | [262] Terminal clip, complete |
| [22] Hex head bolt | [109] Grooved pin | [392] Gasket |
| [24] Lifting eyebolt | [111] Gasket for lower part | [705] Protection canopy |
| [30] Oil seal | [112] Terminal box lower part | [706] Spacer |
| [32] Circclip | [113] Pan head screw | [707] Pan head screw |
| [35] Fan guard | [115] Terminal board | |
| [36] Fan | [116] Terminal clip | |

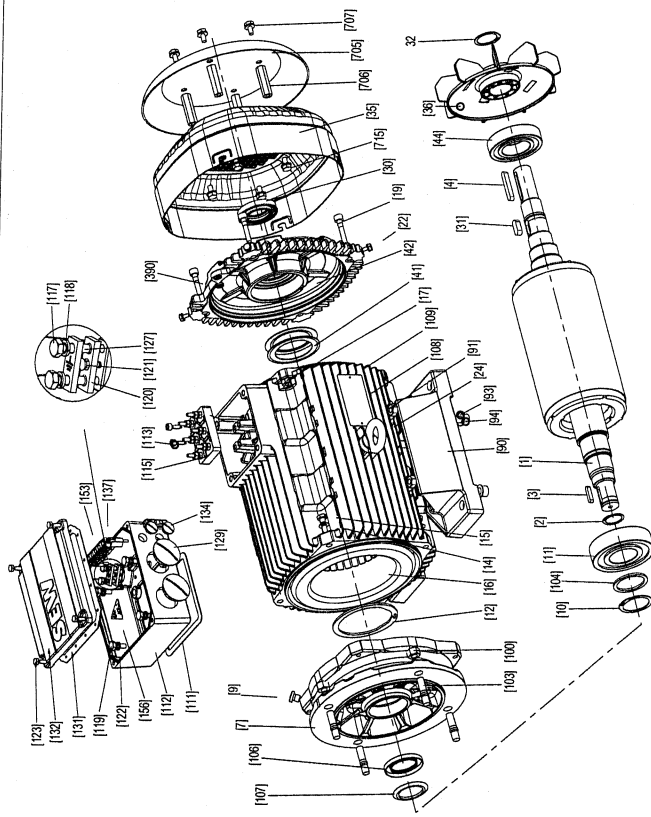


7 Inspection / Maintenance

Inspection and maintenance work on the motor DR71-DR100

7

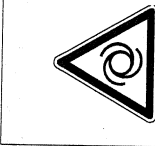
7.5.2 Basic design of the DR.160



527322635

- | | | |
|-------------------------------|-----------------------------------|---------------------------------|
| [1] Rotor | [36] Fan | [119] Hex head bolt |
| [2] Circclip | [41] Spring washer | [120] Grounding terminal bottom |
| [3] Key | [42] Non drive-end bearing shield | [121] Grooved pin |
| [4] Key | [44] Deep groove ball bearing | [122] Lock washer |
| [7] Flange | [90] Foot | [123] Hex head bolt |
| [9] Screw plug | [91] Hexagonal nut | [127] Grounding terminal top |
| [10] Circclip | [93] Disc | [129] Screw plug with O-ring |
| [11] Deep groove ball bearing | [94] Machine screw | [131] Gasket for cover |
| [12] Circclip | [100] Hexagonal nut | [132] Terminal box cover |
| [14] Disc | [103] Stud | [134] Screw plug with O-ring |
| [15] Hex head bolt | [106] Oil seal | [137] Bolt |
| [16] Stator | [107] Oil-flinger ring | [153] Terminal strip, complete |
| [17] Hexagonal nut | [108] Nameplate | [156] Information sign |
| [19] Machine screw | [109] Grooved pin | [390] O-ring |
| [22] Hex head bolt | [111] Seal for bottom part | [705] Protection canopy |
| [24] Lifting eyebolt | [112] Terminal box lower part | [706] Spacer |
| [30] Sealing ring | [113] Bolt | [707] Hex head bolt |
| [31] Key | [115] Terminal board | [715] Hex head screw |
| [32] Circclip | [117] Hex head bolt | |
| [35] Fan guard | [118] Lock washer | |

7.5.3 Inspection steps for DR.71-DR.160 motors



⚠ DANGER

Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.

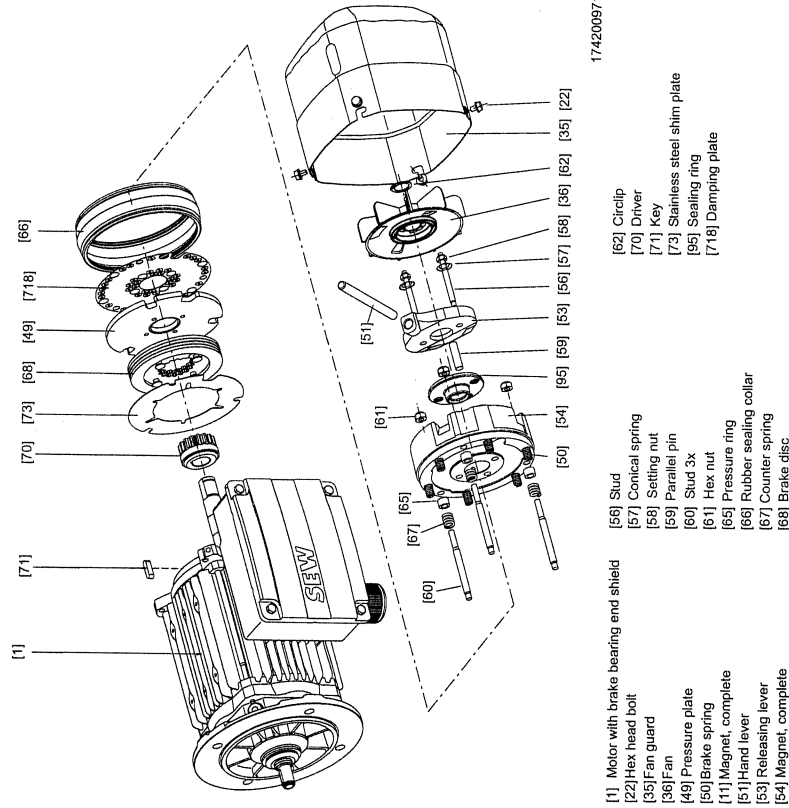
- Disconnect the motor from the power supply before starting work and protect it against unintentional re-start!
- Strictly observe the following instructions!

1. Remove forced cooling fan and incremental encoder, if installed.
See sec. "Preliminary work for motor and brake maintenance" (page 33).
2. Remove fan guard [35] and fan [36].
3. Remove stator:
 - Size DR.71-DR.132: Remove machine screws [13] from flanged endshield [7] and B-side endshield [42]. Remove stator [16] from flanged endshield [7].
 - Size DR.160: Loosen hex head screw [19] and remove B-side endshield [42]. Loosen hex head screw [15] and remove stator from flanged endshield.
4. Visual inspection: Is there any moisture or gear unit oil inside the stator?
 - If not, continue with 7
 - If there is condensation, continue with 5
 - If there is gear oil, have the motor repaired by a specialist workshop
5. If there is moisture inside the stator:
 - With gearmotors: Remove the motor from the gear unit
 - Motors without a gear unit: Remove the A-flange
 - Remove the rotor [1]
6. Clean the winding, dry it and check it electrically (see sec. "Preliminary work" (page 13)).
7. Replace deep groove ball bearings [11], [44] with permitted ball bearings.
See sec. "Permitted anti-friction bearing types" (page 79).
8. Replace the shaft sealing:
 - A-end: Replace oil seal [106]
 - B-end: Replace oil seal [30]
9. Apply grease (Klüber Petamo GHY 133) to the sealing lip.
Replace the stator seat sealing:
 - Seal the sealing surface with duroplastic sealing compound (operating temperature -40...160 °C), such as "Hylomar L Spezial".
 - For size DR.71-DR.132: Replace gasket [392].
10. Install the motor and accessories.



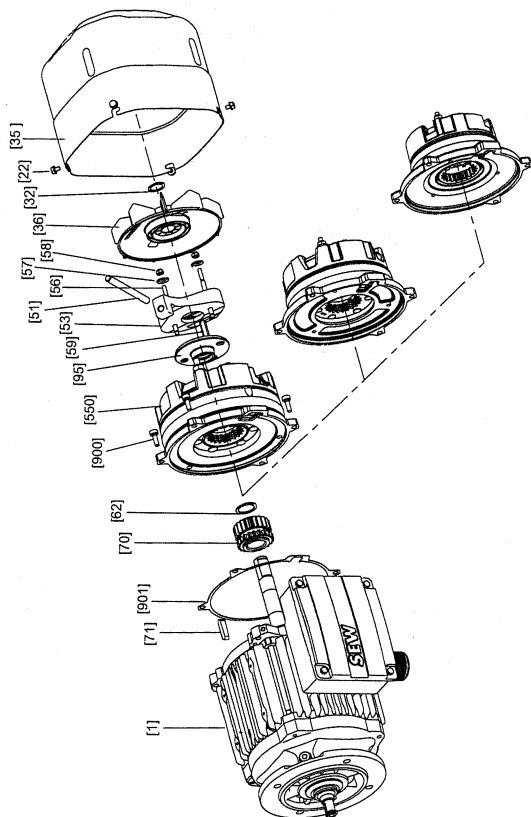
7.6 Inspection and maintenance for DR71-DR100 brake motors

7.6.1 Basic design of DR.71-DR.80 brakemotors



174200971

7.6.3 Basic design of DR.160 brakemotor



- | | | | | | |
|------|-------------------------------------|------|---------------------|-------|---------------------|
| [1] | Motor with brake bearing end shield | [53] | Releasing lever | [70] | Carrier |
| [22] | Hex head bolt | [54] | Stud | [95] | Sealing ring |
| [32] | Circlip | [57] | Conical coil spring | [550] | Pre-assembled brake |
| [35] | Fan guard | [58] | Setting nut | [900] | Screw |
| [36] | Fan | [59] | Parallel pin | [901] | Gasket |
| [51] | Hand lever | [62] | Circlip | | |

179981963

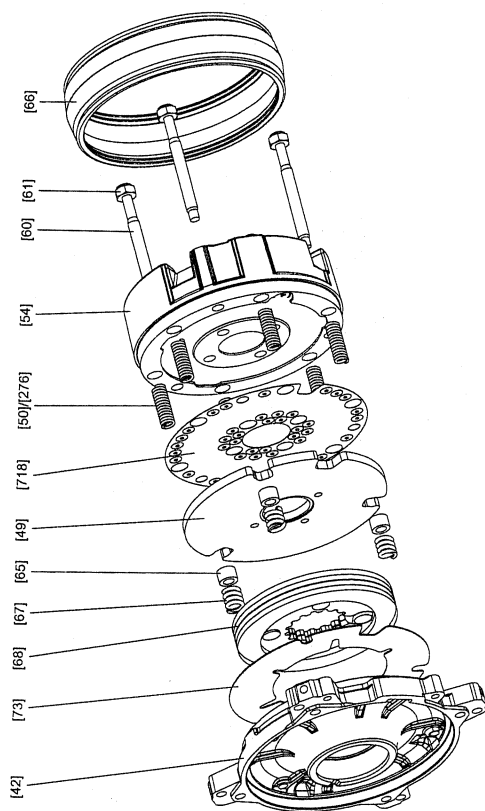
- | | |
|--------------------------|---|
| [55] Closing piece | [550] Pre-assembled brake |
| [56] Stud | [698] Plug connector complete (only for BE20) |
| [57] Conical coil spring | [900] Screw |
| [58] Setting nut | [901] O-ring |
| [62] Circlip | |
| [70] Carrier | |
| [71] Key | |
| [95] Sealing ring | |



Inspection / Maintenance

Inspection and maintenance for DR71-DR100 brake motors

7.6.4 Basic design of BE05-BE2 brake (DR.71-DR.80)



- [42] Brake endshield
- [49] Pressure plate
- [50] Brake spring (standard)
- [54] Magnet, complete
- [60] Stud 3x

- | | | | |
|------|-----------------------|-------|---------------------|
| [61] | Hexagonal nut | [73] | Niro disk |
| [65] | Pressure ring | [276] | Brake spring (blue) |
| [66] | Rubber sealing collar | [718] | Dampening plate |
| [67] | Counter spring | | |
| [68] | Brake disk | | |

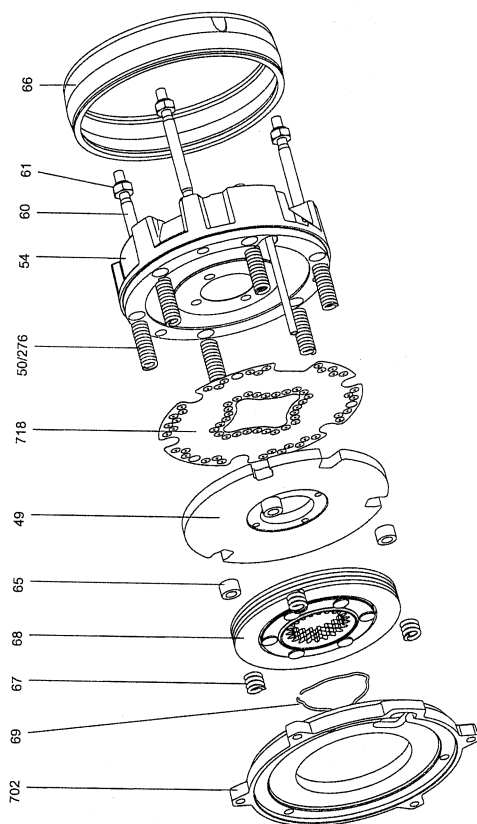
528377739



Inspection / Maintenance

Inspection and maintenance for DR71-DR100 brake motors

7.6.5 Basic design of BE1-BE20 brake (DR.90-DR.160)



- [49] Pressure plate
[50] Brake spring (standard)
[54] Magnet, complete
[60] Stud 3x
[61] Hexagonal nut

- [65] Pressure ring
[66] Rubber sealing collar
[67] Counter spring
[68] Brake disk
[69] Circular spring

- [276] Brake spring (blue)
[702] Friction disk
[718] Dampening plate

174202635



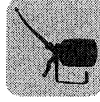
7.6.6 Inspection steps for DR.71-DR.160 brakemotors

! DANGER!

Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.


- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove forced cooling fan and incremental encoder, if installed.
See sec. "Preliminary work for motor and brake maintenance" (page 33).
2. Remove fan guard [35] and fan [36].
3. Remove stator:
 - Size DR.71-DR.132: Remove machine screws [13] from flanged endshield [7] and B-side endshield [42]. Remove stator [16] from flanged endshield [7].
 - Size DR.160: Loosen hex head screw [19] and remove B-side endshield [42]. Loosen hex head screw [15] and remove stator from flanged endshield.
4. Removing the brake cable:
 - Size DR.71-DR.132: Remove the terminal box cover, loosen the brake cable from the rectifier.
 - Size DR.160: Loosen safety screws of the brake plug connector [698] and remove plug connector.
5. Press off the brake from the stator and remove it carefully.
6. Pull the stator back by approx. 3 to 4 cm.
7. Visual inspection: Is there any moisture or gear unit oil inside the stator?
 - If not, continue with 10
 - If there is condensation, continue with 8
 - If there is gear oil, have the motor repaired by a specialist workshop
8. If there is moisture inside the stator:
 - With gearmotors: Remove the motor from the gear unit
 - Motors without a gear unit: Remove the A-flange
 - Remove the rotor [1]
9. Clean the winding, dry it and check it electrically (see sec. "Preliminary work" (page 13)).



10. Replace deep groove ball bearings [11], [44] with permitted ball bearings.
See sec. "Permitted anti-friction bearing types" (page 79).
11. Replace the shaft sealing:
 - A-end: Replace oil seal [106]
 - B-end: Replace oil seal [30]
 Apply grease (Küber Petamo GHY 133) to the sealing lip.
12. Replace the stator seat sealing:
 - Seal the sealing surface with duroplastic sealing compound (operating temperature -40...180 °C), such as "Hylomar L Spezial".
 - For size DR.71-DR.132: Replace gasket [392].
13. Install the motor, brake and accessories.

7.6.7 Setting the working air gap of BE05-BE20 brakes



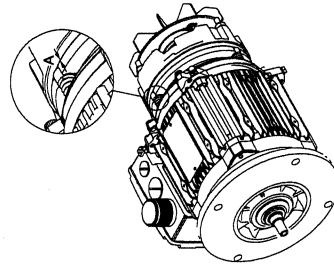
! DANGER!

Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.

- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove the following:
 - Forced cooling fan and incremental encoder, if installed


See sec. "Preliminary work for motor and brake maintenance" (page 33).
2. Push the rubber sealing collar [5] aside,
 - Flange cover or fan guard [21]
 - if necessary, release the clip
 - Vacuum up the abraded matter
3. Measure the brake disk [68]:
 - Minimum brake disk thickness see sec. "Technical Data" (page 68).
 - Replace brake disk if necessary, see sec. "Replacing the brake disk of brakes BE05-BE20" (page 46).
4. Measure the working air gap A (see the following figure) (use a feeler gauge and measure at three points offset by 120°)
 - Between the pressure plate [49] and damping plate [718]
5. Tighten the hexagon nuts [61]:
 - Tighten the setting sleeves
6. Until the working air gap is set correctly, see sec. "Technical Data" (page 68).
7. Install the rubber sealing collar back in place and re-install the dismantled parts.



179978635

7.6.8 Replacing the brake disk of BE05-BE20 brakes


When changing a brake disk, inspect the other removed parts as well and fit new ones if necessary.



! DANGER!

Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.

- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!



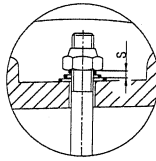
NOTES

- The brake of DR.71-DR.80 motor sizes cannot be removed from the motor because the BE brake is directly installed on the brake endshield of the motor.
- The brake of DR.90-DR.160 motor sizes cannot be removed from the motor for replacing the brake disk because the BE brake is pre-installed on the brake endshield of the motor with a friction disk.

1. Remove the following:
 - Forced cooling fan and incremental encoder, if installed

See sec. "Preliminary work for motor and brake maintenance" (page 33).
2. Removing the brake cable
 - Flange cover or fan guard [35], circlip [32/62] and fan [36]
 - Size DR.71...-DR.132: Remove the terminal box cover, loosen the brake cable from the rectifier.
 - Size DR.160: Loosen safety screws of the brake plug connector [69] and remove plug connector.
3. Remove the rubber sealing collar [66]
4. Loosen hex nuts [61], carefully pull off the magnet [54] (brake cable!) and take out the brake springs [50].
5. Remove the damping plate [718], pressure plate [49] and brake disc [68], and clean the brake components.
6. Install a new brake disk.
7. Re-install the brake components.
 - Except for the fan and the fan guard, because the working air gap has to be set first, see section "Setting the working air gap of the BE05-BE20 brakes" (page 45).

8. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure). **This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.**



177241867

Brake	Floating clearance s [mm]
BE05; BE1; BE2	1.5
BE5; BE11; BE20	2

9. Install the rubber sealing collar back in place and re-install the dismantled parts.

NOTES

- The lockable manual brake release (type HF) is already released if resistance is encountered when operating the grub screw.
- The self-reengaging manual brake release (type HF) can be operated with normal hand pressure.
- In brake motors with self-reengaging manual brake release, the manual brake release lever must be removed after startup/maintenance! A bracket is provided for storing the lever on the outside of the motor.

NOTES

Important: After replacing the brake disc, the maximum braking torque is reached only after several cycles.

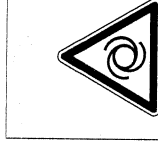
7.6.9 Changing the braking torque of BE05-BE20 brakes

The braking torque can be changed in steps

- By the type and number of brake springs.
- By changing the complete magnet (only possible for BE05 and BE1).
- By changing the brake (from motor size DR.90).

For the possible braking torque steps, please refer to sec. "Technical Data" (page 68).

Changing the
brake spring



⚠ DANGER!

Risk of crushing if the drive starts up unintentionally.

- Severe or fatal injuries.
- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove the following:

- Forced cooling fan and incremental encoder, if installed

See sec. "Preliminary work for motor and brake maintenance" (page 33).

- Flange cover or fan guard [35], circlip [32/62] and fan [36]

2. Removing the brake cable

- Size DR.71...DR.132: Remove the terminal box cover, loosen the brake cable from the rectifier.

- Size DR.160: Loosen safety screws of the brake plug connector [698] and remove plug connector.

3. Remove the rubber sealing collar [66] and the manual brake release:

- Setting nuts [58], conical coil springs [57], studs [56], release lever [53], dowel pin [59]

4. Loosen hex nuts [61], pull off the magnet [54]

- by approx. 50 mm (watch the brake cable!)

5. Change or add brake springs [50/276]

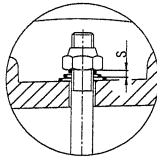
- Arrange brake springs symmetrically

6. Re-install the brake components

- Except for the fan and the fan guard, because the working air gap has to be set first, see section "Setting the working air gap of the BE05-BE20 brakes" (page 45).



7. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure). **This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.**



177241867

Brake	Floating clearance s [mm]
BE05; BE1; BE2	1.5
BE5; BE11; BE20	2

8. Install the rubber sealing collar back in place and re-install the dismantled parts.

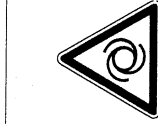


NOTE

Replace setting nuts [58] and hexagon nuts [61] if the removal procedure is repeated.



Changing the magnet

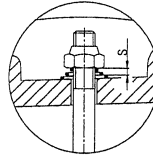


! DANGER!

Risk of crushing if the drive starts up unintentionally.

- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

- Remove the following:
 - Forced cooling fan and incremental encoder, if installed
 - See sec. "Preliminary work for motor and brake maintenance" (page 33).
 - Flange cover or fan guard [35], circlip [32/62] and fan [36]
- Remove the rubber sealing collar [66] and the manual brake release:
 - Setting nuts [58], conical coil springs [57], studs [56], release lever [53]
- Removing the brake cable
 - Size DR.71...-DR.132: Remove the terminal box cover, loosen the brake cable from the rectifier.
 - Size DR.160: Loosen safety screws of the brake plug connector [698] and remove plug connector.
- Loosen hex nuts [61], remove complete magnet [54], replace brake springs [50/276].
- Re-install the brake components
 - Except for the fan and the fan guard, because the working air gap has to be set first, see section "Setting the working air gap of the BE05-BE20 brakes" (page 45).
- With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure). **This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.**



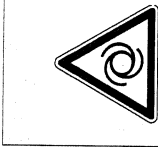
177241867

Brake	Floating clearance s [mm]
BE05; BE1; BE2	1.5
BE5; BE11; BE20	2

7. Install the rubber sealing collar back in place and re-install the dismantled parts.



Changing the
brake of DR.71
and DR.80



! DANGER!

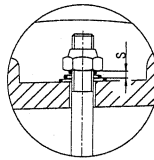
Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.

- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove the following:

- Forced cooling fan and incremental encoder, if installed
See sec. "Preliminary work for motor and brake maintenance" (page 33).
 - Flange cover or fan guard [35], circlip [32/62] and fan [36]
2. Remove the terminal box cover and loosen the brake cable from the rectifier. If necessary, attach trailing wire to brake cables.
3. Loosen machine screws [13], remove brake endshield with brake from stator.
4. Insert brake cable into the terminal box.
5. Align the cam of the brake endshield.
6. Install seal [95].
7. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure).

This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.

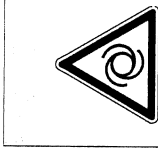


177241867

Brake	Floating clearance s (mm)
BE05; BE1; BE2	1.5
BE5; BE11, BE20	2



Changing the
brake of DR.90 to
DR.160



! DANGER!

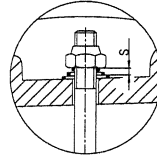
Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.

- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove the following:

- Forced cooling fan and incremental encoder, if installed
See sec. "Preliminary work for motor and brake maintenance" (page 33).
 - Flange cover or fan guard [35], circlip [32/62] and fan [36]
2. Removing the brake cable
- Sizes DR.90...DR.132: Remove the terminal box cover, loosen the brake cable from the rectifier.
 - Size DR.160: Loosen safety screws of the brake plug connector [698] and remove plug connector.
3. Loosen the bolts [900] and remove the brake from the brake endshield.
4. Make sure the seal [901] is aligned properly.
5. Connect brake cable.
6. Align the cam of the friction disc.
7. Install seal [95].

8. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure).
This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.

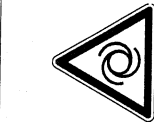


177241867

Brake	Floating clearance s (mm)
BE05; BE1; BE2	1.5
BE5; BE11, BE20	2



7.6.10 Retrofitting HR/HF manual brake release



! DANGER!

Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.

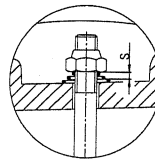
- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove the following:

- Forced cooling fan and incremental encoder, if installed
See sec. "Preliminary work for motor and brake maintenance" (page 33).
 - Flange cover or fan guard [35], circlip [32/62] and fan [36]
- #### 2. Installing manual brake release:
- For size DR.71-DR.132:
 - Remove the sealing ring [95]
 - Screw in studs [56], insert sealing ring for manual brake release [95] and hammer in parallel pin [59].
 - Mount release lever [53], conical coil springs [57] and setting nuts [58].
 - For size DR.160:
 - Screw in studs [56].
 - Mount release lever [53], conical coil springs [57] and setting nuts [58].

3. Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure).

This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



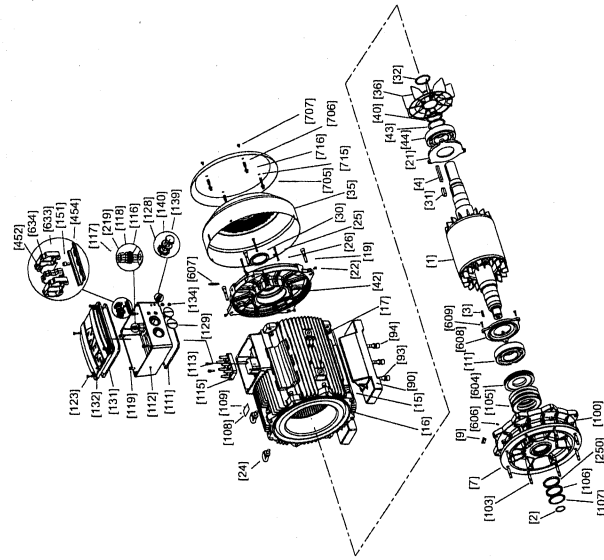
Brake	Floating clearance s [mm]
BE05; BE1; BE2	1.5
BE5; BE11; BE20	2

4. Install the removed parts again.



7.7 Inspection and maintenance work on the DR315 motor

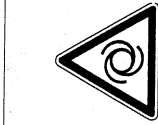
7.7.1 Basic design of the DR.315 motor



- 351998603
- | | | |
|-----------------------------------|-------------------------------|--------------------------|
| [1] Rotor | [43] Supporting ring | [131] Gasket for cover |
| [2] Circlip | [44] Rolling element bearings | [132] Terminal box cover |
| [3] Key | [90] Foot | [134] Screw plug |
| [4] Key | [93] Disc | [139] Hex head screw |
| [7] Flange | [94] Machine screw | [140] Washer |
| [9] Screw plug | [100] Hex nut | [151] Machine screw |
| [11] Rolling element bearings | [103] Stud | [219] Hex nut |
| [15] Machine screw | [105] Spring washer | [250] Oil seal |
| [16] Stator | [106] Oil seal | [452] Terminal strip |
| [17] Hexagonal nut | [107] Oil flinger | [454] DIN rail |
| [19] Machine screw | [108] Nameplate | [604] Grease nipple |
| [21] Oil seal flange | [109] Grooved pin | [607] Grease nipple |
| [22] Hex head bolt | [111] Gasket for lower part | [608] Oil seal flange |
| [24] Lifting eyebolt | [112] Terminal box lower part | [609] Hex head screw |
| [25] Machine screw | [113] Machine screw | [633] End holder |
| [26] Sealing washer | [115] Terminal board | [634] End plate |
| [30] Oil seal | [116] Serrated lock washer | [705] Protection canopy |
| [31] Key | [117] Stud | [706] Spacer bolt |
| [32] Circlip | [118] Washer | [707] Hex head screw |
| [35] Fan guard | [119] Hex head screw | [715] Hex nut |
| [36] Fan | [123] Hex head screw | [716] Washer |
| [40] Circlip | [128] Serrated lock washer | |
| [42] Non drive-end bearing shield | [129] Screw plug | |



7.7.2 Inspection steps for DR.315



! DANGER!

Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.

- Disconnect the motor from the power supply before starting work and protect it against unintentional re-start!
- Strictly observe the following instructions!

1. Remove forced cooling fan and incremental encoder, if installed.
See sec. "Preliminary work for motor and brake maintenance" (page 33).
With gearmotors: Remove the motor from the gear unit.
2. Remove fan guard [35] and fan [36].
3. Loosen hex head screws [25] and [19] and remove B-side endshield [42].
4. Remove machine screws [15] from the flange [7]. Remove rotor [1] completely together with the flange. For gearmotors, remove oil flinger [107].
5. Loosen screws [609] and remove rotor from the flange [7]. Before disassembly, protect oil seal against damage, e.g. with tape or a protective sleeve.
6. Visual inspection: Is there any moisture or gear unit oil inside the stator?
 - If not, continue with 8
 - If there is condensation, continue with 7
 - If there is gear oil, have the motor repaired by a specialist workshop
7. If there is moisture inside the stator:
Clean the winding, dry it and check it electrically (see sec. "Preliminary work" (page 13)).
8. Replace anti-friction bearings [11], [44] with permitted anti-friction bearing types.
See sec. "Permitted anti-friction bearing types" (page 79).
Fill bearings about two thirds full with grease.
See sec. "Bearing lubrication DR.315". (page 31)
Important: Place sealing ring flanges [608] and [21] on the rotor shaft before mounting the bearings.
9. Assemble the motor by aligning it vertically, A-side up.
10. Insert cup springs [105] and lubricating ring [604] in the bearing bore of the flange [7].
Suspend rotor [1] from the B-side thread and insert into the flange [7].
Attach sealing ring flange [608] on the flange [7] using hex head screws [609].



11. Install stator [16].

- Replace the stator seat sealing: Seal the sealing surface with duroplastic sealing compound (operating temperature -40...180 °C), such as "Hylomar L Spezial".

Important: Protect winding overhang from damage!

- Screw in the stator [16] and flange [7] with screws [15].

12. Before mounting the B-side endshield [42], screw in the M8 setscrew approximately 200 mm (7.87 in) into the oil seal flange [21].

13. Mount the B-side endshield [42], feed the setscrew in through a bore for the screw [25]. Screw in the B-side endshield [42] and stator [16] using machine screws [19] and hex nuts [17]. Lift the oil seal flange [21] with the setscrew, and fasten using 2 screws [25]. Remove the setscrew and screw in the remaining screws [25].

14. Renew oil seals

- A-end: Insert the oil seal [106] and the oil seal [250] for gearmotors.

With gearmotors, fill the space between the two oil seals approx. two-thirds full with grease (Klüber Petamo GHY133).

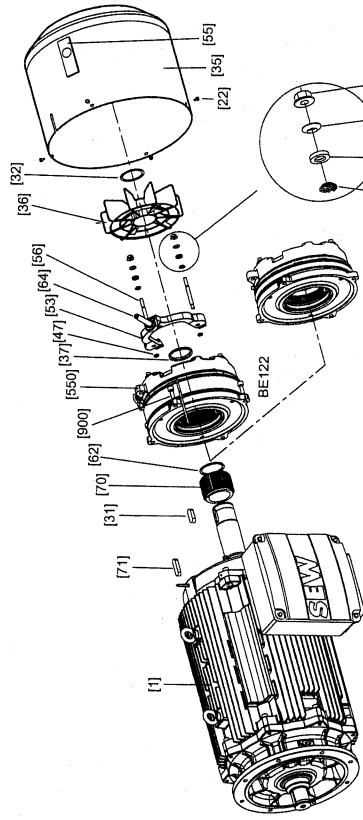
- B-end: Insert the oil seal [30], and coat the sealing lip with the same grease.

15. Reinstall the fan [36] and fan guard [35].



7.8 Inspection and maintenance for DR315 brake motor

7.8.1 Basic design of the DR.315 brakemotor



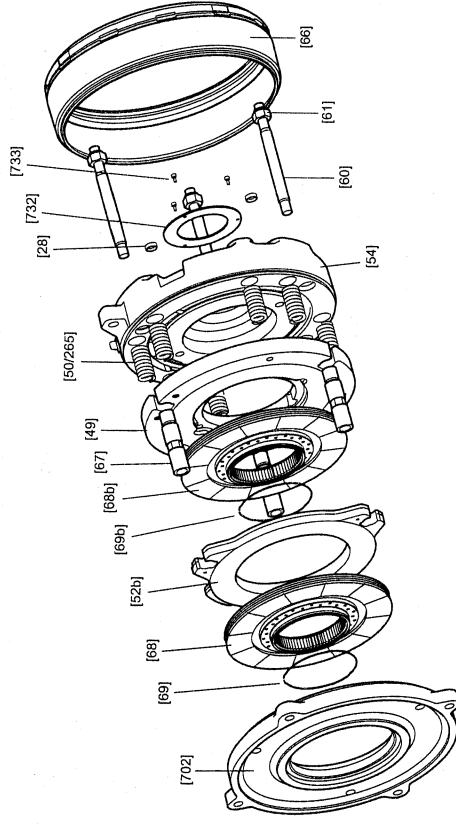
- [1] Motor with brake bearing end shield
- [22] Hex head bolt
- [31] Key
- [32] Circlip
- [35] Fan guard
- [36] Fan
- [37] V-ring
- [47] O-ring
- [53] Release lever
- [55] Closing piece
- [56] Stud
- [57] Concave washer
- [58] Pre-assembled brake
- [59] Bolt
- [62] Circlip
- [64] Setscrew
- [70] Driver

- [71] Key
- [255] Ball cup
- [256] Concave washer
- [550] Pre-assembled brake
- [900] Bolt
- [901] Gasket

353595787



7.8.2 Basic design of BE120-BE122 brakes



- [28] Closing cap
- [49] Pressure plate
- [50] Brake spring
- [52b] Brake lining (only for BE122)
- [54] Magnet, complete
- [60] Stud 3x
- [61] Hexagonal nut

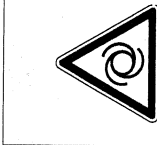
- [66] Rubber sealing collar
- [67] Setting sleeve
- [68] Brake disc
- [68b] Brake disc (only BE122)
- [69] Circular spring
- [69b] Circular spring (only BE122)
- [256] Brake spring

353594123

- [702] Friction disc
- [732] Cover disc
- [733] Bolt



7.8.3 Inspection steps DR.315 brakemotor



! DANGER!

Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.

- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove forced cooling fan and incremental encoder, if installed
See sec. "Preliminary work for motor and brake maintenance" (page 33).
2. Remove fan guard [35] and fan [36]
3. Loosen brake connector
4. Loosen the bolts [900] and remove the pre-assembled brake from the brake end-shield.
5. Loosen hex head screws [25] and [19] and remove B-side endshield [42].
6. Remove machine screws [15] from the flange [7]. Remove rotor [1] completely together with the flange. For gearmotors, remove oil flinger [107].
7. Loosen screws [609] and remove rotor from the flange [7]. Before disassembly, protect oil seal seat against damage, e.g. with tape or a protective sleeve.
8. Visual inspection: Is there any moisture or gear unit oil inside the stator?
 – If not, continue with 8
 – If there is condensation, continue with 7
 – If there is gear oil, have the motor repaired by a specialist workshop
9. If there is moisture inside the stator:
Clean the winding, dry it and check it electrically (see sec. "Preliminary work" (page 33)).
10. Replace anti-friction bearings [11], [44] with permitted anti-friction bearing types.
See sec. "Permitted anti-friction bearing types" (page 79).
Fill bearings about two thirds full with grease.
See sec. "Bearing lubrication DR.315" (page 31)
Important: Place sealing ring flanges [608] and [21] on the rotor shaft before mounting the bearings.
11. Assemble the motor by aligning it vertically, A-side up.
12. Insert cup springs [105] and lubricating ring [604] in the bearing bore of the flange [7].
Suspend rotor [1] from the B-side thread and insert into the flange [7].
Attach sealing ring flange [608] on the flange [7] using hex head screws [609].



13. Install stator [16].

- Replace the stator seat sealing: Seal the sealing surface with duroplastic sealing compound (operating temperature -40...180 °C), such as "Hylomar L Spezial".

Important: Protect winding overhang from damage!

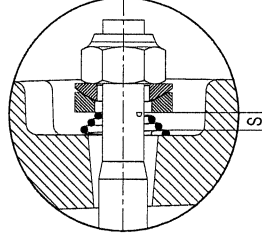
- Screw in the stator [16] and flange [7] with screws [15].
- 14. Before mounting the brake endshield [42], screw in the M8 setscrew approximately 200 mm (7.87 in) into the oil seal flange [21].
- 15. Mount the brake endshield [42], feed the setscrew in through a bore for the screw [25]. Screw in the brake endshield and stator [16] using machine screws [19] and hex nuts [17]. Lift the oil seal flange [21] with the setscrew, and fasten using 2 screws [25]. Remove the setscrew and screw in the remaining screws [25].

16. Renew oil seals

- A-end: Insert the oil seals [106] and the oil seal [250] for gearmotors.
Fill the space between the two oil seals approx. two-thirds full with grease (Küber Petamo GHY133).
- B-end: Insert the oil seal [30], and coat the sealing lip with the same grease. This applies to gearmotors only
- 17. Align cam of the friction disk and mount the brake to the brake endshield using screw [900].

- 18. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure).

This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



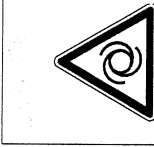
353592459

Brake	Floating clearance s [mm]
BE120; BE122	2

- 19. Reinstall the fan [36] and fan guard [35].
- 20. Install the motor and accessories.



7.8.4 Setting the working air gap of BE120-BE122 brakes

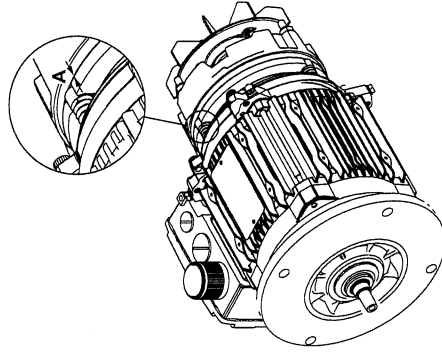


A DANGER!

Risk of crushing if the drive starts up unintentionally.

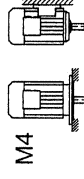
- Severe or fatal injuries.
- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove forced cooling fan and incremental encoder, if installed
See sec. "Preliminary work for motor and brake maintenance" (page 33)
2. Remove fan guard [35] and fan [36]
3. Push the rubber sealing collar [66] aside,
 - if necessary, release the clip
 - Vacuum up the abraded matter
4. Measure the brake disk [68, 68b]:
If brake disk ≤ 12 mm, replace brake disk.
See sec. "Replacing the brake disk of brakes BE120-BE122" (page 63)
5. Loosen the setting sleeve [67] by turning it towards the bearing endshield
6. Measure the working air gap A (see the following figure)
(use a feeler gauge and measure at three points offset by 120°)

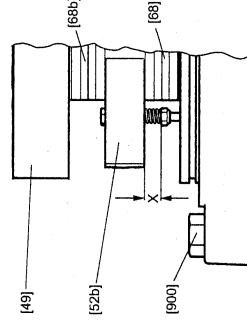
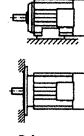


7. Tighten the hexagon nuts [61]
8. For BE 122 in vertical mounting position, set the 2 springs of the brake lining to the following value:

Mounting position	X in [mm]
M4	10.0
M2	10.5



M2



- [49] Pressure plate
- [52b] Brake lining (only for BE122)
- [68] Brake disc
- [68b] Brake disk (only BE122)
- [900] Hexagonal nut

9. Tighten the setting sleeves

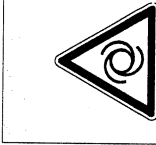
- Against the magnet
- Until the working air gap is set correctly, see sec. "Technical Data" (page 68)

10. Install the rubber sealing collar back in place and re-install the dismantled parts.



7.8.5 Replacing the brake disk of BE120-BE122 brakes

When fitting a new brake disk (thickness ≤ 12 mm), inspect the other removed parts as well and install new ones if necessary.



⚠ DANGER!

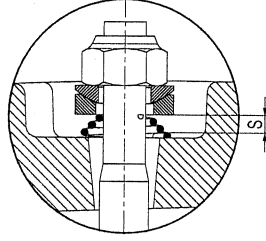
Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.

- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove forced cooling fan and incremental encoder, if installed
See sec. "Preliminary work for motor and brake maintenance" (page 33)
2. Remove fan guard [35], circlip [32] and fan [36]
3. Loosen plug connector on the magnet
4. Remove the rubber sealing collar [66] and the manual brake release:
 - Setting nuts [58], ball cup [255], concave washer [256], conical coil springs [57], studs [56], release lever [53]
5. Loosen hex nuts [61], carefully pull off the magnet [54] and take out the brake springs [50/265].
6. Remove pressure plate [49] and brake disk [68b]. Clean brake components.
7. Install a new brake disk.
8. Re-install the brake components.
 - Except for the fan and the fan guard, because the working air gap has to be set first, see section "Setting the working air gap of the BE120-BE122 brakes" (page 61).



9. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure).
This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



353592459

Brake BE120, BE122	Floating clearance s [mm]
	2

10. Install the rubber sealing collar back in place and re-install the dismantled parts.

NOTES

- The lockable manual brake release (type HF) is already released if resistance is encountered when operating the grub screw.
- After replacing the brake disc, the maximum braking torque is reached only after several cycles.





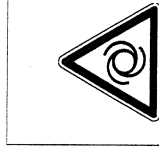
7.8.6 Changing the braking torque of BE120-BE120 brakes

The braking torque can be changed in steps

- By the type and number of brake springs.
- By changing the brake

For the possible braking torque steps, please refer to sec. "Technical Data" (page 68).

Changing the
brake spring



! DANGER!

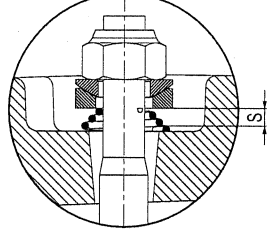
Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.

- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove forced cooling fan and incremental encoder, if installed
See sec. "Preliminary work for motor and brake maintenance" (page 33)
2. Remove flange cover or fan guard [35], circlip [32] and fan [36]
3. Remove plug connector from the magnet [54] and protect against dirt
4. Remove the rubber sealing collar [66] and the manual brake release:
 - Setting nuts [58], ball cup [255], concave washer [256], conical coil springs [57], studs [56], release lever [53]
5. Loosen hex nuts [61], pull off the magnet [54]
 - By approx. 50 mm
6. Change or add brake springs [50/265]
 - Arrange brake springs symmetrically
7. Re-install the brake components
 - Except for the fan and the fan guard, because the working air gap has to be set first, see section "Setting the working air gap of the BE120-BE122 brakes" (page 61).



8. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure).
This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



353592459

Brake	Floating clearance s [mm]
BE120; BE122	2

9. Install the rubber sealing collar back in place and re-install the dismantled parts.


NOTE



Replace setting nuts [58] and hexagon nuts [61] if the removal procedure is repeated.



Changing the
brake DR.315



STOP

STOP

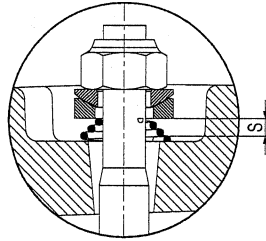
Makes sure that the intended mounting position is permitted according to the data on the nameplate.

⚠ DANGER!

Risk of crushing if the drive starts up unintentionally.
Severe or fatal injuries.

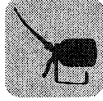
- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!
- Strictly observe the following instructions!

1. Remove forced cooling fan and incremental encoder, if installed
See sec. "Preliminary work for motor and brake maintenance" (page 33)
2. Remove flange cover or fan guard [35], circlip [32] and fan [36]
3. Loosen brake connector
4. Loosen the bolts [900] and remove the brake from the brake endshield.
5. Align cam of the friction disk and mount the brake to the brake endshield using screw [900].
6. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure).
This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



353592459

Brake	Floating clearance s [mm]
BE120; BE122	2



8 Technical Data

8.1 Work done, working air gap, braking torques

Brake type	Work done until maintenance [10 ³ J]	Working air gap [mm]		Brake disc [mm]	Braking torque [Nm]	Type and number of brake springs		Order number of brake springs	
		min. 1)	max.			Standard	Blue	Standard	Blue
BE05	120	0.25	0.6	9.0	5.0 3.5 2.5 1.8	2 2 - -	4 2 6 3	0135 017 X	1374 137 3
BE1	120	0.25	0.6	9.0	10 7.0 5.0	6 4 2	- 2 4	0135 017 X	1374 137 3
BE2	165	0.25	0.6	9.0	20 14 10 7.0	6 2 2 -	- 4 2 4	1374 024 5	1374 052 0
BE5	260	0.25	0.9	9.0	55 40 28 20	6 2 2 -	- 4 2 4	1374 070 9	1374 071 7
BE11	640	0.3	1.2	10.0	110 80 55 40	6 2 2 -	- 4 2 4	1374 183 7	1374 184 5
BE20	1000	0.3	1.2	12.0	200 150 110 80	6 4 3 3	2 2 3 -	1374 322 8	1374 248 5
BE120	520	0.4	1.2	12.0	1000 800 600 400	8 6 4 4	- 2 4 -	1360 877 0	1360 831 2
BE122	520	0.5	1.2	12.0	2000 1600 1200 800	8 6 4 4	- 2 4 -	1360 877 0	1360 831 2

1) When checking the working air gap, note: Parallelism tolerances on the brake disk may give rise to deviations of ± 0.15 mm after a test run.



8.2 Braking torque assignment

8.2.1 Motor size DR.71-DR.100

Motor type	Brake type	Braking torque steps in Nm									
DR.71	BE05	1.8	2.5	3.5	5.0						
	BE1				5.0	7.0	10				
DR.80	BE05	1.8	2.5	3.5	5.0						
	BE1				5.0	7.0	10				
DR.90	BE2					7.0	10	14	20		
	BE1					5.0	7.0	10			
DR.100	BE2					7.0	10	14	20		
	BE5							20	28	40	55
	BE2					7.0	10	14	20		
	BE5							20	28	40	55

8.2.2 Motor sizes DR.112-DR.160

Motor type	Brake type	Braking torque steps in Nm									
DR.112	BE5	28	40	55							
	BE11			40	55						
DR.132	BE5	28	40	55							
	BE11			40	55	80	110				
DR.160	BE11			40	55	80	110				
	BE20				80	110	150	200			

8.2.3 Motor size DR.315

Motor type	Brake type	Braking torque steps in Nm					
DR.315	BE120	400	600	800	1000		
	BE122			800		1200	2000

8.3 Operating currents

8.3.1 Brake BE05/1, BE2

The current values I_H (holding current) listed in the tables are r.m.s. values. Use only devices for measuring r.m.s. values. The inrush current (accelerator current) I_G only flows for a short time (approx. 160 ms) when the brake is released. There is no increased inrush current if the BG or BMS brake rectifiers are used or if there is a direct DC voltage supply - only possible with brakes up to size BE2.

		BE05/1			BE2		
Max. braking torque [Nm]	Braking power [W]	Inrush current ratio I_G/I_H	Rated voltage V_R		I_H [A _{acc}]		I_G [A _{acc}]
			V_{AC}	V_{DC}	I_H [A _{acc}]	I_G [A _{acc}]	I_G [A _{acc}]
24 (23-26)			10		2.10	2.80	2.75
60 (57-63)			24		0.88	1.17	1.46
120 (111-123)			48		0.45	0.58	0.78
184 (174-193)			80		0.29	0.35	0.47
208 (194-217)			90		0.26	0.31	0.42
230 (218-243)			96		0.23	0.29	0.30
254 (244-273)			110		0.20	0.26	0.27
290 (274-306)			125		0.18	0.26	0.24
330 (307-343)			140		0.16	0.20	0.21
360 (344-379)			160		0.14	0.18	0.19
400 (380-431)			180		0.13	0.16	0.17
460 (432-484)			200		0.11	0.14	0.15
500 (485-542)			220		0.10	0.13	0.13
575 (543-600)			250		0.09	0.11	0.12

Key

I_G Accelerator current – brief inrush current
 I_H Holding current r.m.s. value in the supply cable to the SEW brake rectifier
 I_G Direct current with direct DC voltage supply
 V_R Rated voltage (rated voltage range)

Technical Data

Operating currents

8

8.3.2 Brake BE5, BE11, BE20

The current values I_H (holding current) listed in the tables are r.m.s. values. Use only devices for measuring r.m.s. values. The inrush current (accelerator current) I_G only flows for a short time (approx. 160 ms) when the brake is released. There is no increased inrush current when brake rectifiers B and BMS are used. Direct voltage supply is not possible.

	BE5	BE11	BE20
Max. braking torque [Nm]	55	110	200
Braking power [W]	49	77	100
Inrush current ratio I_G/I_H	5,7	6,6	7

Rated voltage V_R		BE5	BE11	BE20
V_{AC}	V_{DC}	I_H [A _{Ac}]	I_H [A _{Ac}]	I_H [A _{Ac}]
60 (57-63)	24	1,25	2,85	2,77
120 (111-123)	48	0,64	1,45	1,39
184 (174-193)	80	0,40	0,92	0,88
208 (194-217)	90	0,36	0,82	0,78
230 (218-243)	96	0,33	0,73	0,70
254 (244-273)	110	0,29	0,65	0,62
290 (274-306)	125	0,26	0,58	0,55
330 (307-343)	140	0,23	0,52	0,49
360 (344-379)	160	0,21	0,47	0,44
400 (380-431)	180	0,18	0,42	0,39
460 (432-484)	200	0,16	0,37	0,35
500 (485-542)	220	0,15	0,33	0,31
575 (543-600)	250	0,13	0,29	0,28

Key

I_G Accelerator current – brief inrush current
 I_H Holding current r.m.s. value in the supply cable to the SEW brake rectifier
 I_G Direct current with direct DC voltage supply
 V_R Rated voltage (rated voltage range)

Technical Data

Operating currents

8

8.3.3 Brake BE120, BE122

The current values I_H (holding current) listed in the tables are r.m.s. values. Use only devices for measuring r.m.s. values. The inrush current (accelerator current) I_G only flows for a short time (approx. 400 ms) when the brake is released. Direct voltage supply is not possible.

	BE120	BE122
Max. braking torque [Nm]	1000	2000
Braking power [W]	250	250
Inrush current ratio I_G/I_H	4,9	4,9

Rated voltage V_R		BE120	BE122
V_{AC}	V_{DC}	I_H [A _{Ac}]	I_H [A _{Ac}]
230 (218-243)	-	1,80	1,80
254 (244-273)	-	1,60	1,60
290 (274-306)	-	1,43	1,43
360 (344-379)	-	1,14	1,14
400 (380-431)	-	1,02	1,02
460 (432-484)	-	0,91	0,91
500 (485-542)	-	0,81	0,81
575 (543-600)	-	0,72	0,72

Key

I_G Accelerator current – brief inrush current
 I_H Holding current r.m.s. value in the supply cable to the SEW brake rectifier
 I_G Direct current with direct DC voltage supply
 V_R Rated voltage (rated voltage range)

8.4 Resistances

8.4.1 Brake BE05/1, BE2

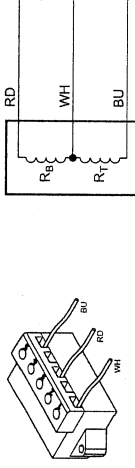
		BE05/1		BE2	
Max. braking torque [Nm]		5/10		20	
Braking power [W]		32		43	
Inrush current ratio I_B/I_H		4		4	
Rated voltage V_R					
V_{AC}	V_{DC}	R_B	R_T	R_B	R_T
24 (23-26)	10	0.77	2.35	0.57	1.74
60 (57-63)	24	4.85	14.8	3.60	11.0
120 (111-123)	48	19.4	59.0	14.4	44.0
184 (174-193)	80	48.5	148	36.0	111
208 (194-217)	90	61.0	187	45.5	139
230 (218-243)	96	77.0	125	58.0	174
254 (244-273)	110	97.0	295	72.0	220
290 (274-306)	125	122	370	91	275
330 (307-343)	140	154	470	115	350
360 (344-379)	160	194	590	144	440
400 (380-431)	180	245	740	182	550
460 (432-484)	200	310	940	230	690
500 (485-542)	220	385	1180	290	870
575 (543-600)	250	490	1480	365	1100

8.4.2 Brake BE5, BE11, BE20

		BE5		BE11		BE20	
Max. braking torque [Nm]		55		110		200	
Braking power [W]		49		77		100	
Inrush current ratio I_R/I_H		5.7		6.6		7	
Rated voltage V_R		BE5		BE11		BE20	
V_{AC}	V_{DC}	R_B	R_T	R_B	R_T	R_B	R_T
60 (57-63)	24	2.20	10.5	1.20	7.6	0.8	5.0
120 (111-123)	48	8.70	42.0	4.75	30.5	3.4	20.0
184 (174-193)	80	22.0	105	12.0	76.0	8.5	50.4
208 (194-217)	90	27.5	132	15.1	96	10.6	63.5
230 (218-243)	96	34.5	166	19.0	121	13.4	79.9
254 (244-273)	110	43.5	210	24.0	152	16.9	100.6
290 (274-306)	125	55.0	265	30.0	191	21.2	126.6
330 (307-343)	140	69.0	330	38.0	240	26.7	159.4
360 (344-379)	160	87.0	420	47.5	305	33.7	200.7
400 (380-431)	180	110	530	60	380	42.4	252.7
460 (432-484)	200	138	660	76	480	53.3	318.1
500 (485-542)	220	174	830	95	600	67.2	400.4
575 (543-600)	250	220	1050	120	760	84.5	504.1

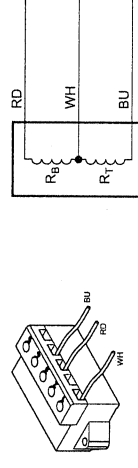
8.4.3 Resistance measurement BE05-BE20

Cut-off in the AC circuit The following figure shows the resistance measurement for a cut-off in the AC circuit.



Cut-off in the DC and AC circuits

The following figure shows the resistance measurement for a cut-off in the AC and DC circuits.



BS Accelerator coil
TS Coil section
 R_B Accelerator coil resistance at 20 °C [Ω]
 R_T Coil section resistance at 20 °C [Ω]
 V_R Rated voltage (rated voltage range)

RD red
WH white
BU blue

NOTE



For measuring the resistance of the RT coil section or the RB accelerator coil, remove the white conductor from the brake rectifier. If it remains connected, the internal resistance of the brake rectifier will cause erroneous results.

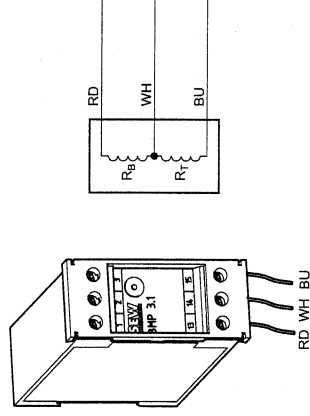
8.4.4 Brake BE120, BE122

		BE120		BE122	
Max. braking torque [Nm]		1000		2000	
Braking power [W]		250		250	
Inrush current ratio I_B/I_N		4.9		4.9	

		BE120		BE122	
Rated voltage V_R					
V_{AC}					
V_{DC}					
230 (218-243)		7.6	29.5	7.6	29.5
254 (244-273)		9.5	37.0	9.5	37.0
290 (274-306)		12.0	46.5	12.0	46.5
360 (344-379)		19.1	74.0	19.1	74.0
400 (380-431)		24.0	93.0	24.0	93.0
460 (432-484)		30.0	117.0	30.0	117.0
500 (485-542)		38.0	147.0	38.0	147.0
575 (543-600)		48.0	185.0	48.0	185.0

Resistance measurement BE120, BE122

The following figure shows the resistance measurement for BMP 3.1.



- BS Accelerator coil
- TS Coil section
- R_g Accelerator coil resistance at 20 °C [Ω]
- R_r Coil section resistance at 20 °C [Ω]
- V_R Rated voltage (rated voltage range)

NOTE

For measuring the resistance of the RT coil section or the RB accelerator coil, remove the white conductor from the brake rectifier. If it remains connected, the internal resistance of the brake rectifier will cause erroneous results.

8.5 Brake rectifier combinations

8.5.1 Brake BE05/1, BE2, BE5, BE11, BE20

The following table shows the standard and optional combinations of brakes and brake rectifiers.

	BE05	BE1	BE2	BE5	BE11	BE20
Size	Size 1.5	X ¹	X ¹	—	—	—
	Size 3	X ²	X ²	—	—	—
BGE	BGE 1.5	•	•	X ¹	X ¹	X ¹
	BGE 3	•	•	X ²	X ²	X ²
BS	BS 24	X	X	—	—	—
BMS	BMS 1.5	•	•	—	—	—
	BMS 3	•	•	—	—	—
BME	BME 1.5	•	•	•	•	•
	BME 3	•	•	•	•	•
BMH	BMH 1.5	•	•	•	•	•
	BMH 3	•	•	•	•	•
BMK	BMK 1.5	•	•	•	•	•
	BMK 3	•	•	•	•	•
BMP	BMP 1.5	•	•	•	•	•
	BMP 3	•	•	•	•	•
BMV	BMV 5	•	•	•	•	•
BSG	BSG	•	•	X	X	X
	BGE 3 + SR 11	•	•	•	•	•
BSR	BGE 3 + SR 15	•	•	•	•	•
	BGE 1.5 + SR 11	•	•	•	•	•
	BGE 1.5 + SR 15	•	•	•	•	•
BUR	BGE 3 + UR 11	•	•	•	•	•
	BGE 1.5 + UR 15	•	•	•	•	•

- X Standard design
- X¹ Standard design with brake rated voltage of AC 150 - 500 V
- X² Standard design with brake rated voltage of AC 24/42 - 150 V
- Optional
- Not permitted

8.5.2 Brake BE120, BE122

The following table shows the standard and optional combinations of brakes and brake rectifiers.

	BE120	BE122
BMP 3.1	X	X

8.6 Brake control

8.6.1 Wiring space of the motor

The following table lists the technical data of brake control systems for installation in the motor wiring space and the assignments with regard to motor size and connection technology. The different housings have different colors (= color code) to make them easier to distinguish.

Motor size DR.71-
DR.160

Type	Function	Voltage	Holding current I_{Hmax} [A]	Type	Part number	Color code
Size	One-way rectifier	AC 150...500 V	1.5	Size 1.5	825 384 6	black
		AC 24...500 V	3.0	Size 3	825 386 2	brown
BGE	One-way rectifier with electronic switching	AC 150...0.500 V	1.5	BGE 1.5	825 385 4	red
		AC 42...0.150 V	3.0	BGE 3	825 387 0	blue
BSR	One-way rectifier + current relay for cut-off in the DC circuit	AC 150...500 V	1.0	BGE 1.5 + SR 11	825 385 4	
			1.0	BGE 1.5 + SR 15	825 385 4	
		AC 42...0.150 V	1.0	BGE 3 + SR 11	826 762 6	
			1.0	BGE 3 + SR 15	825 387 0	
BUR	One-way rectifier + voltage relay for cut-off in the DC circuit	AC 150...500 V	1.0	BGE 1.5 + UR 15	825 385 4	
		AC 42...0.150 V	1.0	BGE 3 + UR 11	825 387 0	
BS	Varistor protection circuit	DC 24 V	5.0	BS24	826 763 4	Aqua
BSG	Electronic switching	DC 24 V	5.0	BSG	825 459 1	white

Motor size DR.315

Type	Function	Voltage	Holding current I_{Hmax} [A]	Type	Part number	Color code
BMP	One-way rectifier with electronic switching, integrated voltage relay for cut-off in the DC circuit.	AC 230...0.575 V	2.8	BMP 3.1	829 507 7	

8.6.2 Control cabinet

The following tables list the technical data of brake control systems for installation in the control cabinet and the assignments with regard to motor size and connection technology. The different housings have different colors (= color code) to make them easier to distinguish.

Motor size DR.71-
DR.160

Type	Function	Voltage	Holding current I_{Hmax} [A]	Type	Part number	Color code
BMS	One-way rectifier such as BG	AC 150...500 V	1.5	BMS 1.5	825 802 3	black
BME	One-way rectifier with electronic switching such as BGE	AC 42...150 V	3.0	BMS 3	825 803 1	brown
		AC 150...0.500 V	1.5	BME 1.5	825 722 1	red
BMH	One-way rectifier with electronic switching and heating function	AC 42...150 V	3.0	BME 3	825 723 X	blue
		AC 150...0.500 V	1.5	BMH 1.5	825 818 X	Green
BMP	One-way rectifier with electronic switching, integrated voltage relay for cut-off in the DC circuit	AC 42...150 V	3	BMH 3	825 819 8	yellow
		AC 150...0.500 V	1.5	BMP 1.5	825 685 3	white
BMK	One-way rectifier with electronic switch mode, 24 V _{DC} control input and separation in the DC circuit	AC 42...150 V	3.0	BMP 3	826 666 6	Light blue
		AC 150...0.500 V	1.5	BMK 1.5	826 463 5	Aqua
BMV	Brake control unit with electronic switching, 24 V _{DC} control input and fast cut-off	AC 42...150 V	3.0	BMK 3	826 667 4	Bright red
		DC 24 V	5.0	BMV 5	1 300 006 3	white

Motor size DR.315

Type	Function	Voltage	Holding current I_{Hmax} [A]	Type	Part number	Color code
BMP	One-way rectifier with electronic switching, integrated voltage relay for cut-off in the DC circuit.	AC 230...0.575 V	2.8	BMP 3.1	829 507 7	

8.7 Permitted roller bearing types

8.7.1 Anti-friction bearing types for motor sizes DR.71-DR.160

Motor type	Drive-end bearing		Non drive-end bearing	
	IEC motor	Gearmotor	AC motor	Brakemotor
DR.71	6204-2Z-J-C3	6303-2Z-J-C3	6203-2Z-J-C3	6203-2RS-J-C3
DR.80	6205-2Z-J-C3	6304-2Z-J-C3	6304-2Z-J-C3	6304-2RS-J-C3
DR.90-DR.100	6306-2Z-J-C3		6205-2Z-J-C3	6205-2RS-J-C3
DR.112-DR.132	6308-2Z-J-C3		6207-2Z-J-C3	6207-2RS-J-C3
DR.160	6309-2Z-J-C3		6209-2Z-J-C3	6209-2RS-J-C3

8.7.2 Anti-friction bearing types for motor size DR.315

Motor type	Drive-end bearing		Non drive-end bearing	
	IEC motor	Gearmotor	IEC motor	Gearmotor
DR.315K				
DR.315S	6319-J-C3	6319-J-C3	6319-J-C3	6319-J-C3
DR.315M		6322-J-C3		6322-J-C3
DR.315L				

Motor with reinforced bearing

Motor type	Drive-end bearing		Non drive-end bearing	
	IEC motor	Gearmotor	IEC motor	Gearmotor
DR.315K				
DR.315S	NU319E		6319-J-C3	6319-J-C3
DR.315M				6322-J-C3
DR.315L				

8.8 Lubricant tables

8.8.1 Lubricant table for roller bearings

The bearings are 2Z or 2RS closed bearings and cannot be regreased.
Motor size DR.71-DR.160

Motor anti-friction bearings	Ambient temperature		Manufacturer	Type	DIN designation
	-20 °C ... 80 °C	+20 °C ... 100 °C			
			Esso	Polyrex EM ¹⁾	K2P-20
			Klüber	Barrierta L55/2 ²⁾	KX2U
			Kyodo Yushi	Multemp SRL ²⁾	K2N-40

- 1) Mineral lubricant (= mineral-based anti-friction bearing grease)
- 2) Synthetic lubricant (= synthetic-based anti-friction bearing grease)

Motor size DR.315

Motors of size DR.315 can be equipped with a relubrication device.

Motor anti-friction bearings	Ambient temperature		Manufacturer	Type	DIN designation
	-20 °C ... 80 °C	-40 °C ... 60 °C			
			Esso	Polyrex EM ¹⁾	K2P-20
			SKF	GXN ¹⁾	K2N-40

- 1) Mineral lubricant (= mineral-based anti-friction bearing grease)

8.9 Order data for lubricants and anti-corrosion agents

The lubricants and anti-corrosion agents can be ordered directly from SEW-EURO-DRIVE with the following order number.

Usage	Manufacturer	Type	quantity	Order number
Lubricant for anti-friction bearings	Esso	Polyrex EM	400 g	09101470
	SKF	GXN	400 g	09101276
Lubricant for Sealing rings	Klüber	Petamo GHY 133	10 g	04963458
Anti-corrosion agents and lubricants	SEW-EURODRIVE	Noco [®] Fluid	5.5 g	09107819

9 Appendix

9.1 Wiring diagrams

NOTE

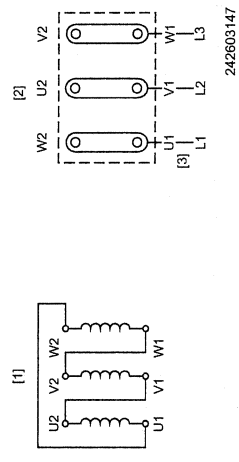
Connect the motor as shown in the wiring diagram or the assignment diagram included with the motor. The following section only gives an overview of the most common connection options. You can obtain the valid wiring diagrams free of charge from SEW-EURODRIVE.

9.1.1 Delta and star connection

AC motor

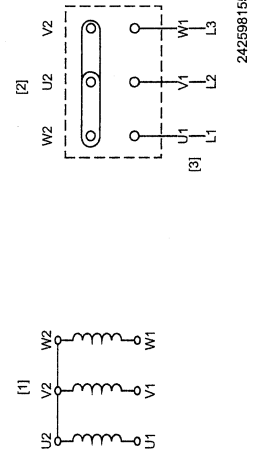
For all motors with one speed, direct on-line or Δ - Δ startup.

The following figure depicts the Δ connection for low voltage.



- [1] Motor winding
- [2] Motor terminal board
- [3] Incoming cables

The following figure depicts the Δ connection for high voltage.



- [1] Motor winding
- [2] Motor terminal board
- [3] Incoming cables

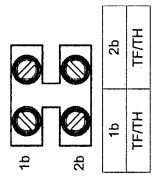
Change in direction of rotation: Replacing two incoming cables (L1 - L2).

9.1.2 Motor protection using TF or TH with DR71-100

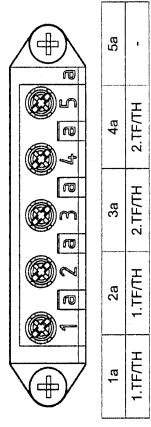
The following figures show the connection of the motor protection with TF PTC thermistor sensors or TH bimetallic thermostats.

Either a two-pole terminal clip or a five-pole terminal strip is available for connecting to the trip switch.

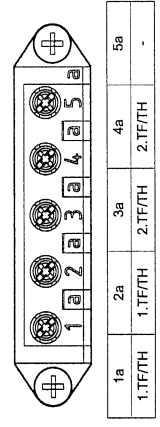
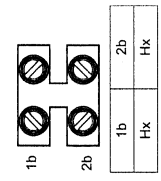
Example: TF/TH to a two-pole terminal strip



Example: 2 x TF/TH to a five-pole terminal strip



The following figure shows the connection of the motor protection with 2 TF PTC thermistor sensors or TH bimetal thermostats and Hx anti-condensation heater.

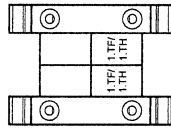


9.1.3 Motor protection using TF or TH with DR315

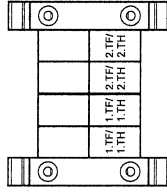
The following figures show the connection of the motor protection with TF PTC thermistor sensors or TH bimetallic thermostats.

Depending on the design an x-pole terminal clip is available for connecting to the trip switch.

Example: TF/TH to terminal strip



Example: 2 x TF/TH to terminal strip



9.1.4 Brake control BGE; BG; BSG; BUR

Brake BE

Brake control BGE; BG; BSG; BUR;

Apply voltage to release the brake (see nameplate).

Contact rating of the brake contactors: AC3 according to EN 60947-4-1

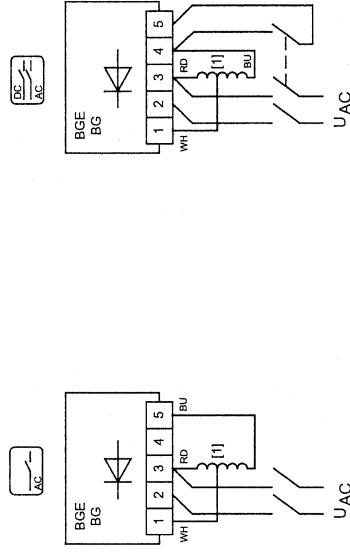
The voltage can be distributed as follows:

- Through a separate supply cable
- From the motor terminal board

This does not apply to multi-speed and frequency-controlled motors.

BG / BGE

The following figure shows the wiring for BG and BGE brake rectifiers for the AC-side cut-off as well as the DC and AC-side cut-off.

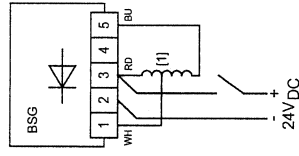


[1] Brake coil

242604811

BSG

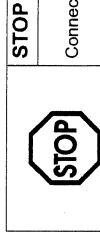
The following figure shows the DC 24 V connection of the BSG control unit



242606475

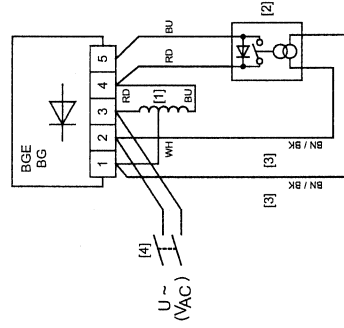
[1] Brake coil

BUR



Connection to motor terminal board not permitted.

The following figure shows the wiring for the BUR brake control



242608139

[1] Brake coil
[2] Voltage relay UR11/UR15
UR 11 (42-150 V) = BN
UR 15 (150-500 V) = BK

9.1.5 BSR brake control

Brake BE

BSR brake control system

Brake voltage = Phase voltage

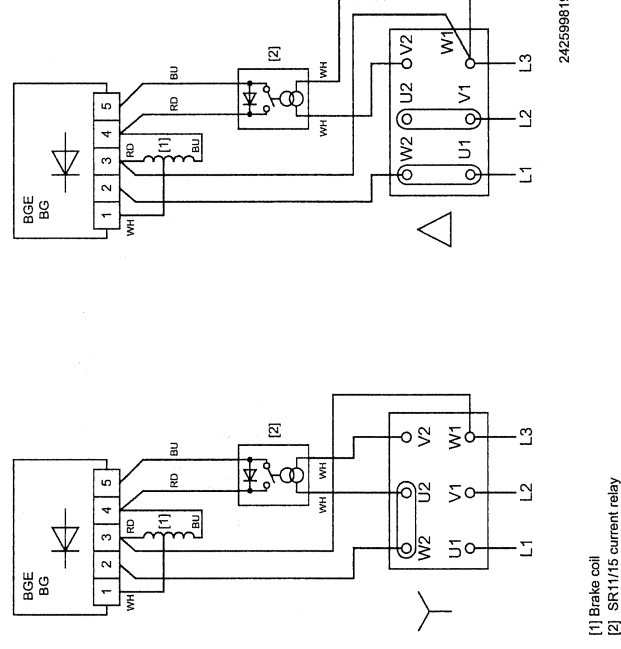
The white connecting leads are the ends of a converter loop and, depending on the motor connection, must be connected to the motor terminal block instead of the Δ or Λ bridge.

Factory wiring Λ

The following figure shows the factory wiring for the BSR brake control

Example: Motor: AC 230 V / AC 400 V

Brake: AC 230 V



[1] Brake coil

[2] SR11/15 current relay

9.1.6 BMP3.1 brake control in the terminal box

Brake BE120; BE122

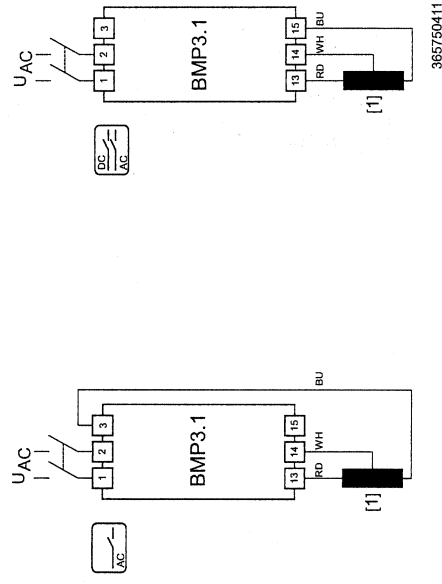
BMP3.1 brake control

Apply voltage to release the brake (see nameplate).

Contact rating of the brake contactors: AC3 according to EN 60947-4-1

Separate supply cables are required for the voltage supply.

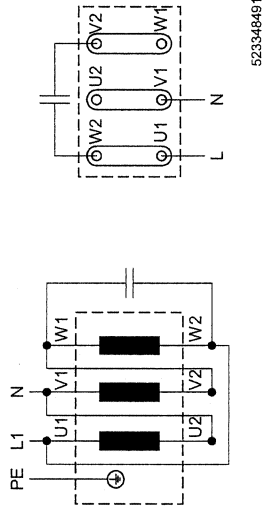
The following figure shows the wiring for the BMP3.1 brake recifier for the AC-side cut-off as well as the DC and AC-side cut-off.



[1] Brake coil

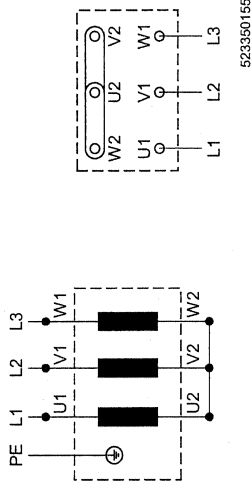
9.1.7 V forced cooling fan

The following figure shows the wiring of the V forced cooling fan for delta-Steinmetz connection.



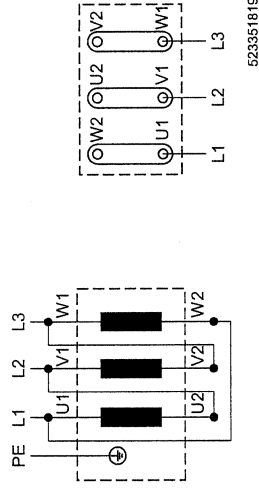
Δ connection

The following figure shows the wiring of the V forced cooling fan for Δ connection.



Δ connection

The following figure shows the wiring of the V forced cooling fan for Δ connection.

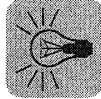


10 Malfunctions

10.1 Motor malfunctions

Malfunction	Possible cause	Remedy
Motor does not start up	Interruption in supply cable	Check the connections and (intermediate) terminal points, correct if necessary
	Brake does not release	See Sec. "Brake faults" (page 91)
	Supply cable fuse has blown	Replace fuse
	Motor protection (switch) has triggered	Check that the motor protection (switch) is set correctly; current specification is on the nameplate
	Motor contactor does not trip	Check motor contactor control
Motor does not start or only with difficulty	Malfunction in control or in the control process	Observe the switching sequence; correct if necessary
	Motor power designed for delta connection but used in star connection	Correct the connection from star to delta; follow the wiring diagram
	Motor power designed for star-star connection but only connected in star	Correct the connection from star to star-star; follow the wiring diagram
Motor does not start in star connection, only in delta connection	Voltage or frequency deviate considerably from setpoint, at least while being switched on.	Provide better power supply system; reduce the power supply load; Check cross section of supply cable, replace with cable of larger cross section if needed
	Torque not sufficient in start connection	If the delta inrush current is not too high (observe the regulations of the power supplier), start up directly in delta; Check the project planning and use a larger motor or special version if necessary (consult with SEW-EURODRIVE)
	Contact fault on star/delta switch	Check the switch; replace if necessary; Check the connections
	Motor connected incorrectly	Swap two phases of the motor supply cable
	Brake does not release	See Sec. "Brake faults" (page 91)
Incorrect direction of rotation	Winding defective	Send motor to specialist workshop for repair
	Rotor rubbing	
	Short circuit in the motor supply cable	Rectify short circuit
	Supply cables connected incorrectly	Correct the wiring, observe the wiring diagram
	Short circuit in motor	Send motor to specialist workshop for repair
Fuses blow or motor protection trips immediately	Ground fault on motor	
	Motor overload	Measure power, check project planning and use larger motor or reduce load if necessary
	Voltage drops	Check cross section of supply cable, replace with cable of larger cross section if needed
Severe speed loss under load	Overload	Measure power, check project planning and use larger motor or reduce load if necessary
	Insufficient cooling	Provide for cooling air supply or clear cooling air passages; retrofit forced cooling fan if necessary. Check the air filter, clean or replace if necessary
	Ambient temperature is too high	Observe the permitted temperature range, reduce the load if necessary
	Motor in delta connection instead of star connection as provided for	Correct the wiring, observe the wiring diagram
	Loose contact in supply cable (one phase missing)	Tighten loose contact, check connections, observe wiring diagram
Motor heats up excessively (measure temperature)	Fuse has blown	Look for and rectify cause (see above); replace fuse
	Mains voltage deviates from the rated motor voltage by more than 5 % (range A) / 10% (range B).	Adjust motor to mains voltage.
	Rated operation type (S1 to S10, DIN 57530) exceeded, e.g. through excessive starting frequency	Adjust rated operation type of motor to required operating conditions; if necessary call in a specialist to determine correct drive

Malfunction	Possible cause	Remedy
Excessively loud	Ball bearing compressed, contaminated or damaged	Re-align motor and the driven machine, inspect anti-friction bearing and replace if necessary. See sec. "Permitted anti-friction bearing types" (page 79).
	Vibration of rotating parts	Look for the cause, possibly an imbalance; correct the cause, observe method for balancing
	Foreign bodies in cooling air passages	Clean cooling air passages

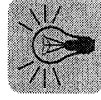


Malfunctions

Brake malfunctions

10.2 Brake malfunctions

Malfunction	Possible cause	Remedy
Brake does not release	Incorrect voltage on brake control unit	Apply the correct voltage; brake voltage specified on the nameplate
	Brake control unit failed	Install a new brake control, check resistances and insulation of the brake coils (see "Resistances" section for resistance values). Check switchgear, replace if needed
	Max. permitted working air gap exceeded because brake lining worn down.	Measure and set working air gap. See the following section: <ul style="list-style-type: none"> "Setting the working air gap of brakes BE05-BE20" (page 45) "Setting the working air gap of brakes BE120-BE122" (page 61) If the brake disk is too thin, replace the brake disk. See the following section: <ul style="list-style-type: none"> "Replacing the brake disk of brakes BE05-BE20" (page 46) "Replacing the brake disk of brakes BE120-BE122" (page 63)
	Voltage drop on supply cable > 10%	Provide correct connection voltage; brake voltage specifications on the nameplate. Check the cross section of the brake supply cable, increase cross section if necessary
	Inadequate cooling, brake overheats	Provide for cooling air supply or clear cooling air passages, check air filter, clean or replace if necessary. Replace type BG brake rectifier with type BGE
	Brake coil has interturn fault or short circuit to exposed conductive part	Check resistances and insulation of the brake coils (see "Resistances" section for resistance values); Replace complete brake and brake control system (specialist workshop). Check switchgear, replace if needed
	Rectifier defective	Replace rectifier and brake coil; it may be more economical to replace the complete brake



Malfunctions

Brake malfunctions

Malfunction	Possible cause	Remedy
Brake does not brake	Working air gap not correct	Measure and set working air gap. See the following section: <ul style="list-style-type: none"> "Setting the working air gap of brakes BE05-BE20" (page 45) "Setting the working air gap of brakes BE120-BE122" (page 61) If the brake disk is too thin, replace the brake disk. See the following section: <ul style="list-style-type: none"> "Replacing the brake disk of brakes BE05-BE20" (page 46) "Replacing the brake disk of brakes BE120-BE122" (page 63)
	Brake lining worn down.	Replace entire brake disc. See the following section: <ul style="list-style-type: none"> "Replacing the brake disk of brakes BE05-BE20" (page 46) "Replacing the brake disk of brakes BE120-BE122" (page 63)
	Incorrect braking torque.	Check the project planning and change the braking torque if needed; see sec. "Work done, working air gap, braking torques" (page 68) <ul style="list-style-type: none"> by changing the type and number of brake springs. See the following section: <ul style="list-style-type: none"> "Changing the braking torque of brakes BE05-BE20" (page 48) "Changing the braking torque of brakes BE120-BE122" (page 65) <ul style="list-style-type: none"> By selecting a different brake See section "Braking torque assignment" (page 69)
	Working air gap so large that setting nuts of the manual brake release come into contact.	Set the working air gap. See the following section: <ul style="list-style-type: none"> "Setting the working air gap of brakes BE05-BE20" (page 45) "Setting the working air gap of brakes BE120-BE122" (page 61)
	Manual brake release device not set correctly	Set the setting nuts for the manual brake release correctly See the following section: <ul style="list-style-type: none"> "Changing the braking torque of brakes BE05-BE20" (page 48) "Changing the braking torque of brakes BE120-BE122" (page 65)
Brake is applied with time lag	Brake locked by manual brake release HF	Loosen the setscrew, remove if needed
Noises in vicinity of brake	Brake is switched on AC voltage side only	Switch both the DC and AC sides (e.g. through retrofitting the current relay from SR to BSR or the voltage relay from UR to BUR), observe wiring diagram
	Gearing wear on the brake disk or the carrier caused by jolting startup	Check the project planning, replace the brake disk if needed See the following section: <ul style="list-style-type: none"> "Replacing the brake disk of brakes BE05-BE20" (page 46) "Replacing the brake disk of brakes BE120-BE122" (page 63)
	Pulsating torques due to incorrectly set frequency inverter	Have a specialist workshop replace the carrier Check / correct setting of frequency inverter according to operating instructions.



10.3 Malfunctions when operated with a frequency inverter



The symptoms described in the "Motor Problems" section may also occur when the motor is operated with a frequency inverter. Please refer to the frequency inverter operating instructions for the meaning of the problems that occur and to find information about rectifying the problems.

10.4 Customer service

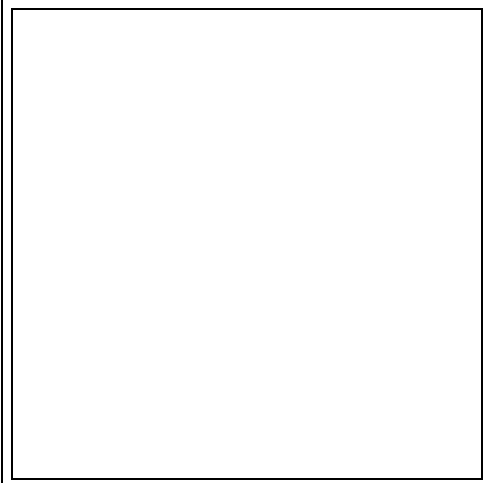
Please have the following information to hand if you require the assistance of our customer service:

- Nameplate data (complete)
- Type and extent of the problem
- Time the problem occurred and any accompanying circumstances
- Assumed cause

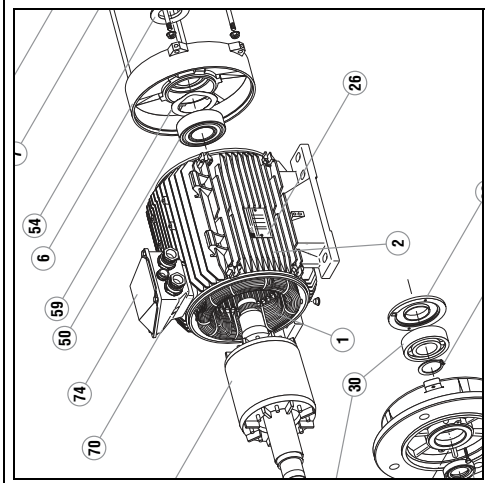
7.2 ELECTRIC MOTORS (LEROY-SOMER)

Function / Location	ECL Code	Motor ref.	Power	Brake Ref.	Recommended Braking Torque N.m
(x1) 36T tapping tool	1-10-887-72	FLS 225	37 kW	–	–
(x1) Turret rotation mechanism	1-10-065-83	LSMV 132 M	7,5 kW	FCR	80 N.m
(x1) 36T tapping tool / hook rotation	1-10-886-91	LS71	0.18 kW	FMD	2.5N.m \pm 20%





This manual is to be given to
the end user



3-phase TEFV induction motors (slip-ring or cage type)

Installation and maintenance

IMPORTANT

These symbols   appear in this document whenever it is important to take special precautions during installation, operation, maintenance or servicing of the motors.

It is essential that electric motors are installed by experienced, qualified and authorised personnel.

In accordance with the main requirements of EEC Directives, the safety of people, animals and property should be ensured when fitting the motors into machines.

Particular attention should be given to equipotential ground or earthing connections.

The noise level of the machines, measured under standard conditions, conforms to the requirements of the standard and does not exceed the maximum value of 85 dB(A) pressure at 1 metre.



The following preliminary precautions must be taken before working on any stationary device:

- Mains voltage disconnected and no residual voltage present
- Careful examination of the causes of the stoppage (blocked transmission - loss of phase - Cut-out due to thermal protection - lack of lubrication, etc)

Dear Customer,

You have just acquired a LEROY-SOMER motor.

This motor benefits from the experience of one of the largest manufacturers in the world, using state-of-the-art technology in automation, specially selected materials and rigorous quality control. As a result, the regulatory authorities have awarded our motor factories the ISO 9001 - Edition 2000 international certificate.

We thank you for making this choice, and would ask you to read the contents of this manual.

By observing a few essential rules, you will ensure problem-free operation for many years.

MOTEURS LEROY-SOMER

CE conformity

Our motors conform to standard EN 60034 (IEC 34), and therefore to the Low Voltage Directive 73/23/EEC modified by Directive 93/68, which is demonstrated by their marking with the symbol 

MOTEURS LEROY-SOMER
UNITE

DECLARATION DE CONFORMITE ET D'INCORPORATION

La constructeur MOTEURS LEROY-SOMER déclare que les composants :

sont en conformité avec la norme harmonisée EN 60 034 (CEI 34) et répondent ainsi aux exigences de la Directive 73-23/EEC du 19 février 1973.

Les composants ainsi définis, répondent aussi aux exigences essentielles de la Directive Compatibilité Electromagnétique 89-336 EEC du 3 mai 1989 modifiée par les Directives 92-31 CE et de 28 avril 1992 et 93-68 CEE du 22 juillet 1993, s'ils sont utilisés dans certaines limites de tension (CEI 34).

Ces conformités permettent l'utilisation de ces gammes de composants dans une machine soumise à l'application de la Directive Machines 89-392 CEE, sous réserve que leur intégration ou leur utilisation dans la machine ne soit pas contraire aux prescriptions de la norme EN 60204 "Equipement Electrique des Machines" et à nos instructions d'installation.

Les composants définis ci-dessus ne pourront être mis en service avant que la machine dans laquelle ils sont incorporés n'ait été déclarée conforme aux directives qui lui sont applicables.

Nota : Lorsque les composants sont alimentés par des convertisseurs électroniques adaptés aux machines à induction, les composants doivent être utilisés conformément aux prescriptions installées par un professionnel qui se rend responsable au respect des règles de la compatibilité électromagnétique dans le pays où la machine est utilisée.

Emetteur de la déclaration


Directeur Qualité

MOTEURS LEROY-SOMER

Fait à

le

Signature



NOTES: LEROY-SOMER reserves the right to modify the characteristics of its products at any time in order to incorporate the latest technological developments. The information contained in this document may therefore be changed without notice.
Copyright 2003: LEROY-SOMER
This document is the property of LEROY-SOMER.
It may not be reproduced in any form without prior authorisation.
All brands and models have been registered and patents applied for.

CONTENTS

1 - RECEIPT	5
1.1 - Identification	5
1.2 - Storage	6
2 - ASSEMBLY	6
2.1 - Checking the insulation	6
2.2 - Location - ventilation	7
2.3 - Coupling	7
2.4 - Electrical guidelines	10
2.5 - Mains connection	13
3 - ROUTINE MAINTENANCE	16
3.1 - Lubrication	16
3.2 - Bearing maintenance	17
3.3 - Slip-ring motors	17
4 - PREVENTIVE MAINTENANCE	18
5 - TROUBLESHOOTING GUIDE	19
6 - CORRECTIVE MAINTENANCE: GENERAL	20
6.1 - Dismantling the motor	20
6.2 - Checks before reassembly	20
6.3 - Mounting the bearings on the shaft	20
6.4 - Reassembling the motor	20
6.5 - Reassembling the terminal box	20
7 - POSITION OF LIFTING RINGS	21
8 - SPARE PARTS	22

INDEX


Adjustment	8
Alarms - early warning	12
Assembly	6
Balancing	7
Belts	9
Built-in thermal protection	12
Cable gland	13
Cables: cross-section	14 - 15
Capacitors	11
Connection	15
Connection diagrams	15
Corrective maintenance	20 - 29
Coupling	7 - 8
Coupling sleeves	8
Digistart	10
Direction of rotation	15
Draining condensation	16
Earth terminal	15
Earthing	11
European directives	5
Frequency inverter	10
Greasing - Grease nipples	6 - 16 - 17
Handling	7
Identification	1
Inertia flywheel	8
Insulation	6
Lifting rings	21
Location	7
Logos	5
Lubrication	16
Mains connection	13
Nameplate	5
Power	10
Power supply	15
Preventive maintenance	18
Protection	11
Pulleys	9
Receipt	1
Routine maintenance	17
Shields	16 - 17
Slide rails	9
Slip-ring motors	11 - 17
Space heaters	12
Spare parts	22
Starting	10
Storage	6
Terminal box	13
Terminal box: tightening the nuts	15
Tie rods: tightening	20
Tolerances	8
Troubleshooting	19
Ventilation	7

1 - RECEIPT


On receipt of your motor, check that it has not suffered any damage in transit.
If there are obvious signs of knocks, contact the carrier (you may able to claim on their insurance) and after a visual check, turn the motor by hand to detect any malfunction.


1.1 - Identification


As soon as you receive the motor, check that the nameplate on the machine conforms to your order.


*  MOT. 3 ~ FLSC 355 LB N 703 481 00 HA 002 kg : 1550									
IP 55	IK 08	I cl	F	40 C	S1	%	d/h		
V	Hz	min ⁻¹	kW	cos φ	A				
Δ 380	50	2840	3	0.89	6.4				
Δ 400	-	2860	-	0.83	6.3				
Y 690	-	-	-	-	3.6				
Δ 415	-	2870	-	0.79	6.7				
Δ 440	60	3430	3.6	0.90	6.5				
Δ 460	-	3455	-	0.87	6.3				

* Other logos may be used as an optional extra.
This must be agreed prior to ordering.

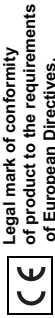
*  MOT. 3 ~ FLSB 180 M N 596 059 GH 001 kg : 208									
IP 55	IK 08	I cl	F	40 C	S3	40 %	6 d/h		
V	Hz	min ⁻¹	kW	cos φ	A				
Δ 220	50	1427	17	0.88	60				
Y 380	50	1427	17	0.88	35				
U _N	250				I _N				
					42				

*  MOT. 3 ~ FLSB 180 M N 596 059 GH 001 kg : 208									
IP 55	IK 08	I cl	F	40 C	S3	40 %	6 d/h		
V	Hz	min ⁻¹	kW	cos φ	A				
Δ 220	50	1427	17	0.88	60				
Y 380	50	1427	17	0.88	35				
U _N	250				I _N				
					42				

*  MOT. 3 ~ FLSB 180 M N 596 059 GH 001 kg : 208									
IP 55	IK 08	I cl	F	40 C	S3	40 %	6 d/h		
V	Hz	min ⁻¹	kW	cos φ	A				
Δ 220	50	1427	17	0.88	60				
Y 380	50	1427	17	0.88	35				
U _N	250				I _N				
					42				

*  MOT. 3 ~ FLSB 180 M N 596 059 GH 001 kg : 208									
IP 55	IK 08	I cl	F	40 C	S3	40 %	6 d/h		
V	Hz	min ⁻¹	kW	cos φ	A				
Δ 220	50	1427	17	0.88	60				
Y 380	50	1427	17	0.88	35				
U _N	250				I _N				
					42				

Definition of symbols used on nameplates:



MOT 3 ~ : 3-phase A.C. motor
LS : Series
100 : Frame size
L : Housing symbol
TR : Impregnation index

Motor no.
N° : Motor batch number

for motor types 80 to 355:
H* : Year of production
A** : Month of production
002 : Serial number

*G = 1996 **A = January
H = 1997 B = February

IP55 IK08 : Degree of protection
(I) cl F : Insulation class F
40°C : Contractual ambient operating temperature
S : Duty
% : Operating factor
...d/h : Number of cycles per hour
kg : Weight
V : Supply voltage
Hz : Supply frequency
min⁻¹ : Revolutions per minute
kW : Rated power
cos φ : Power factor
A : Rated current
Δ : Delta connection
U_R : Rotor voltage
I_R : Rotor current

Bearings
DE : Drive end
Drive end bearing
NDE : Non drive end
Bearing at non drive end
60 cm³ : Amount of grease at each regreasing (in cm³)
4500 H : Lubrication interval (in hours) for θ amb stated at 50 Hz frequency
3000 H : Lubrication interval (in hours) for θ amb stated at 60 Hz frequency
UNIREX N3 : Type of grease

1.2 - Storage

Prior to commissioning, machines should be stored:
- Away from humidity: at relative humidity levels greater than 90% the machine insulation can drop very rapidly, to just above zero at around 100%. The state of the anti-rust protection on unpainted parts should be monitored.
For very long storage periods the motor can be placed in a sealed package (for example heat-shrunk plastic) containing sachets of desiccant.
- Away from frequent significant variations in temperature, to avoid the risk of condensation. During storage the drain plugs must be removed to allow condensation water to escape.
- If the area is subject to vibration, try to reduce the effect of this vibration by placing the motor on a damping support (rubber plate or similar) and turn the rotor a fraction of a turn once a fortnight to prevent the bearing rings from becoming marked.
- Do not discard the rotor locking device (where there are roller bearings).
Even if the motor has been stored in the correct conditions, certain checks must be carried out before it is started up:

Greasing

Bearings which cannot be regreased
Maximum storage: 3 years. After this time, replace the bearings (see section 6.3).

Bearings which can be regreased


Grease grade 2	Grease grade 3	
less than 6 months	less than 1 year	The motor can be commissioned without regreasing.
more than 6 months less than 1 year	more than 1 year less than 2 years	Regrease before commissioning, as described in section 3.1
Storage period		
more than 1 year less than 5 years	more than 2 years and less than 5 years	Dismantle the bearing - Clean it - Replace the grease completely
more than 5 years	more than 5 years	Change the bearing - Regrease it completely

Greases used by LEROY-SOMER


(see nameplate):
- grade 2: KYODO SRL2 - ELF CHEVRON SRI 2
- grade 3: ESSO UNIREX N 3 - SHELL ALVANIA G3
- KLUBER BO 72-72 (for 2P > or = 315 ST)

2 - ASSEMBLY

In all cases, compatibility of the motor and its environment must be guaranteed before its installation and also throughout its life.

 Electric motors are industrial products. They must therefore be installed by qualified, experienced and authorised personnel. The safety of people, animals and property must be ensured when fitting the motors into machines (please refer to current standards).

2.1 - Checking the insulation

 Before starting the motor, it is advisable to check the insulation between the phases and earth, and between phases.

This check is essential if the motor has been stored for longer than 6 months or if it has been kept in a damp atmosphere. This measurement must be carried out using a megohmmeter at 500V D.C. (do not use a megohmmeter system).

It is better to carry out an initial test at 30 or 50 volts and if the insulation is greater than 1 megohm, carry out a second test at 500 volts for 60 seconds. The insulation value must be at least 10 megohms in cold state.

If this value cannot be achieved, or if the motor may have been splashed with water or salt spray, or kept for a long period in a very humid place or if it is covered with condensation, it is advisable to dry the stator for 24 hours in a drying oven at a temperature of between 110°C and 120°C. If it is not possible to place the motor in a drying oven:

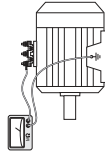
- Switch on the motor, with the rotor locked, at 3-phase A.C. voltage reduced to approximately 10% of the rated voltage, for 12 hours (use an induction regulator or a reduction transformer with adjustable outlets). For slip-ring motors, this test should be performed with the rotor short-circuited.


- Or supply the 3-phases in series with a D.C. current, with the voltage at 1 to 2% of the rated voltage (use a D.C. generator with independent excitation or batteries for motors of less than 22 kW).


- NB: The A.C. current must be monitored using a clamp ammeter, and the D.C. current using a shunt ammeter. This current must not exceed 60% of the rated current.

It is advisable to place a thermometer on the motor housing: if the temperature exceeds 70 °C, reduce the indicated voltage or current by 5% of the original value for every 10° difference.

While it is drying, all the motor orifices must be open (terminal box, drain holes).



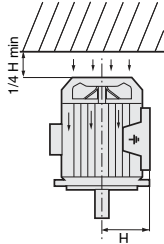
 Warning: if the high voltage test, carried out at the factory before despatch, needs to be repeated, it should be performed at half the standard voltage, i.e.: 1/2 (2U+1000V). Check that the capacitive effect resulting from the high voltage test is eliminated before connecting the terminals to earth.

Prior to commissioning for all motors:
 **Rotate the motor at no load (no mechanical load) for 2 to 5 minutes, checking that there is no abnormal noise. If there is any abnormal noise, see section 5.**

2.2 - Location - ventilation

Our motors are cooled in accordance with method IC 411 (standard IEC 34-6), i.e. "machine cooled by its surface, using the ambient fluid (air) flowing along the machine".

The fan at the non drive end cools the motor. Air is sucked in through the grille of a fan cover (which provides protection against the risk of direct contact with the fan in accordance with standard IEC 34-5) and blown along the housing fins to ensure thermal equilibrium of the motor whatever the direction of rotation.



The motor must be installed in an adequately ventilated area, with clearance for the air intake and outlet of at least one-quarter of the frame size.

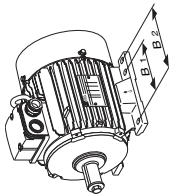
Obstruction (clogging) - even accidental - of the fan cover grille has an adverse effect on motor operation. In the case of vertical operation with the shaft extension facing down, it is advisable to fit the motor with a drip cover to prevent penetration by any foreign bodies.

It is also necessary to check that the hot air is not being recycled. If it is, pipes must be provided for the intake of cold air and the discharge of hot air, in order to prevent abnormal motor temperature rise. In this case, if the air is not circulated by an auxiliary fan, the dimensions of the pipes must be such that the pressure losses are negligible compared to those of the motor.

Positioning


The motor must be mounted in the position specified on the order, on a base which is rigid enough to prevent distortion and vibration.

Where the motor feet have six fixing holes, it is preferable to use those which correspond to the standard dimensions for the motor power rating (refer to the technical catalogue for induction motors), or, failing that, to those shown at B2.



Ensure there is easy access to the terminal box, the condensation drain plugs and, if appropriate, to the grease nipples.

Use lifting equipment which is compatible with the weight of the motor (indicated on the nameplate).

 **If a motor is started up without a coupling device having been fitted, carefully immobilise the key in its location.**

Beware of backdriving when the motor is switched off. The appropriate precautions must be taken:

- For pumps, a non-return valve must be installed.
- For mechanical devices, install a backstop or a holding brake.
- Etc.

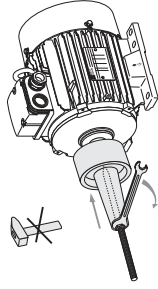
Tolerances and adjustments

The standard tolerances are applicable to the mechanical characteristics given in our catalogues. They comply fully with the requirements of IEC standard 72-1.

- Users must adhere strictly to the instructions provided by the transmission device supplier.

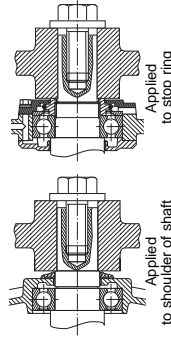
- Avoid impacts which could damage the bearings.

Use a spanner and the tapped hole of the shaft end with a special lubricant (e.g. molykote grease) to make it easier to fit the coupling.




The hub of the transmission device must be:

- Fully in contact with the shoulder of the shaft or, if this is missing, against the metal stop ring which forms a labyrinth seal and thus locks the bearing in place (do not crush the seal).
- Longer than the shaft extension (2 to 3 mm) so that it can be tightened using a screw and washer. If it is not, a spacer ring must be inserted without cutting the key (if this ring is large, it must be balanced).



If there is a second shaft extension, it must only be used for direct coupling and the same recommendations must be followed.

 **The 2nd shaft extension may also be smaller than the main shaft extension, and under no circumstances can it deliver torques greater than half the rated torque.**

The inertia flywheels device must not be mounted directly onto the shaft extension, but installed between end shield and device using a coupling.

Mounting a face mounted motor

Mounting face mounted motors IM B14 (IM 3601) and IM B34 (IM 2101).

Max. screw insertion length when mounting face mounted motors IM B34 and IM B14.

	Max. insertion (mm)
LS 56 F65 M5	11
LS 63 F75 M5 / F85 M6	15
LS 71 F75 M5 / F85 M6	13
LS 80 F100 M6	11
LS 90 F115 M8	11
LS 100 F130 M8	11
LS 112 F130 M8	11
LS 132 F215 M12	11
LS 160 F215 M12	15

Direct connection onto the machine

When the mobile device (pump or fan turbine) is mounted directly on the motor shaft extension, check that this device is perfectly balanced and that the radial force and the axial thrust are within the limits indicated in the catalogue for the bearing withstand.

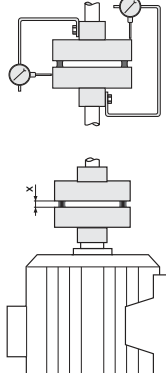
Direct connection using a flexible coupling

Selection of the coupling sleeve should take account of the rated torque to be transmitted and the safety factor dependent on the starting conditions for the electric motor.

The machines must be carefully aligned, so that any lack of concentricity and parallelism in the two coupling halves is compatible with the recommendations of the coupling sleeve manufacturer.

Both parts of the coupling should be provisionally assembled to make it easier to alter their relative position.

Adjust the parallel plane of both shafts using a gauge. Measure the distance between the two coupling surfaces at one point on the circumference. Rotate them 90°, 180° and 270° in relation to this initial position, and measure each time. The difference between the two extremes of the value "x" must not exceed 0.05 mm for standard couplings.



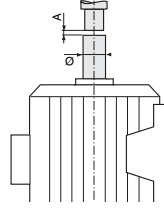
To perfect this adjustment and at the same time check the concentricity of the two shafts, fit 2 gauges as shown in the diagram and slowly turn both shafts.

The deviations registered by either shaft will indicate the need for either an axial or radial adjustment if the deviation exceeds 0.05mm.

Direct connection using a rigid coupling

Both shafts must be aligned so as to adhere to the tolerances of the coupling sleeve manufacturer.

Maintain the minimum distance between the two shaft extensions to allow for expansion of the motor shaft and the load shaft.



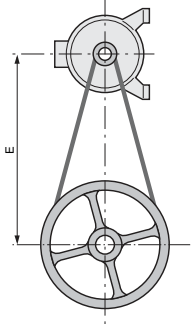
Ø (mm)	A (mm) min.
9 to 55	1
60	1.5
65	1.5
75	2
80	2

Transmission via belt pulleys

The user can choose the diameter of the pulleys.
Cast iron pulleys with a diameter greater than 315 are not recommended for rotation speeds of 3000 min⁻¹.
Flat belts cannot be used for rotation speeds of 3000 min⁻¹ or more.

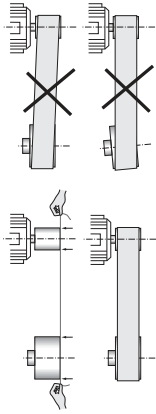
Positioning the belts

So that the belts can be correctly positioned, allow for possible adjustment of approximately 3% with respect to the calculated distance E.
Force must never be used when fitting the belts.
For notched belts, position the notches in the pulley grooves.



Aligning the pulleys

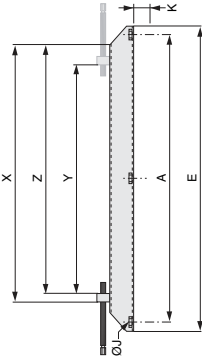
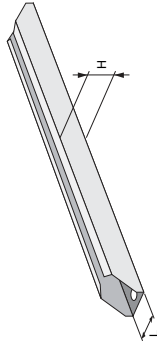
Check that the motor shaft is completely parallel with that of the receiving pulley.



Protect all rotating devices before power-up.

Optional: Standard slide rails (conforming to standard NFC 51-105)

These steel slide rails are supplied with tension screws and the 4 nuts and bolts for fixing the motor on the slide rails, but the fixing bolts for the slide rails are not supplied.



Motor frame size	Type of slide rail	Dimensions										Weight per pair of slide rails (kg)
		A	E	H	K	L	X	Y	Z	Ø J		
80 and 90	G 90/8 PM	355	395	40	2,5	50	324	264	294	13		3
100, 112 and 132	G 132/10 PM	480	530	49,5	7	60	442	368	405	15		6
160 and 180	G 180/12 PM	630	686	60,5	7	75	575	475	525	19		11
200 and 225	G 225/16 PF	800	864	75	28,5	90	-	623	698	24		16
250 and 280	G 280/20 PF	1000	1072	100	35	112	-	764	864	30		36
315 and 355	G 355/24 PF	1250	1330	125	36	130	-	946	1064	30		60

2.4 - Electrical guidelines

2.4.1 - Maximum power of motors supplied directly (kW) from the mains

This extract from standard NFC 15-100 indicates the limits tolerated for D.O.L. starting of a motor connected to the mains power supply.

Type of motor	Single phase 230 (220) V	3-phase 400 (380) V
Type of premises	D.O.L. starting	Other starting modes
Residential areas	1,4	5,5
Other locations*		
Overhead power	3	11
Underground	5,5	22

* "Other locations" include premises such as those in the service sector, the industrial sector, general housing services, the agricultural sector, etc.

Prior inspection by the power supply company is necessary for motors driving a high inertia machine, motors with time-delay starting and brake motors or reversers using reverse current.

2.4.2 - Limiting problems caused by motor starting

In order to protect the installation, all significant temperature rises in the cabling conduits must be prevented, while ensuring that the protection devices are not triggered during starting.

Operating problems in other equipment connected to the same supply are due to the voltage drop caused by the current demand on starting - many times greater than the current absorbed by the motor at full load (approximately 7). See the LEROY-SOMER induction motors technical catalogue).

Even though the mains supplies increasingly allow D.O.L. starting, the current inrush must be reduced for certain installations.

Jolt-free operation and soft starting ensure greater ease of use and an increased lifespan for the machines being driven. The two essential parameters for starting cage induction motors are:

- starting torque
- starting current

The starting torque and the resistive torque determine the starting time.

Depending on the load being driven, it may be necessary to adapt the torque and the current to the machine starting time and to the possibilities of the mains power supply.

The five essential modes are:

- D.O.L. starting
- Star/delta starting
- Soft starting with autotransformer
- Soft starting with resistors
- Electronic starting

The "electronic" starting modes control the voltage at the motor terminals during the entire starting phase and enable very soft, jolt-free starting.

2.4.3 - LEROY-SOMER "Digistart" electronic starter

This is a multi-function electronic system with a microcontroller, which is used with all 3-phase cage induction motors.

It provides soft starting of the motor with:

- Reduction of the starting current
 - Gradual, jolt-free acceleration, achieved by controlling the current absorbed by the motor.
- After starting, the DIGISTART performs additional motor control functions in its other operating phases: steady state and deceleration.

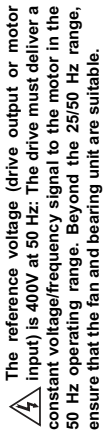
- 9 to 500 kW models

- Supply: 220 to 700 V - 50/60 Hz

DIGISTART is economical to install, as a fused switch is the only additional device needed.

2.4.4 - Other control systems

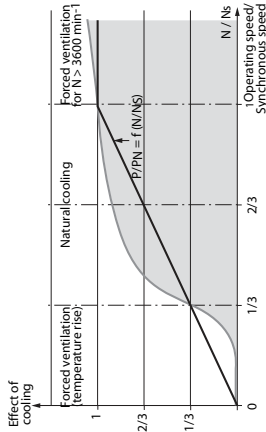
Frequency inverters, flux vector control, etc. Special precautions need to be taken when standard induction motors are being used for variable speed control, powered by a frequency inverter or voltage controller.



The reference voltage (drive output or motor input) is 400V at 50 Hz: The drive must deliver a constant voltage/frequency signal to the motor in the 50 Hz operating range. Beyond the 25/50 Hz range, ensure that the fan and bearing unit are suitable.

During prolonged operation at low speed, cooling efficiency is greatly diminished. It is therefore advisable to install a forced ventilation unit that will produce a constant flow of air independently of the motor speed.

In prolonged operation at high speed, the fan may make excessive noise. It is again advisable to install a forced ventilation system.



If the frequency exceeds 50 Hz:

- a - Carefully check that all the components on a particular transmission are properly aligned.
- b - The voltage remains constant above 50 Hz.
- c - The power supplied by the motor up to 60 Hz remains constant (make sure that the power absorbed by the load does not vary differently in this frequency range).
- d - Check that the application speed does not exceed the speed values indicated in the table below:

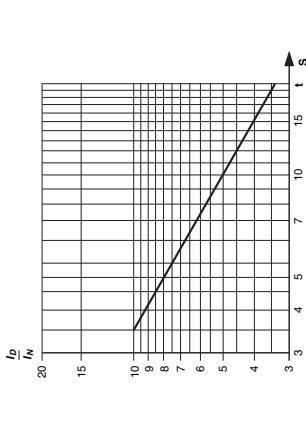
Frame size	Speed of rotation min ⁻¹		
	2 poles	4 poles	6 poles
56*	4500	4500	4500
	63*	4500	4500
	71*	4500	4500
80	4500	15000	15000
90	12000	12000	12000
100	10000	10000	10000
112	10000	10000	10000
132	7500	7500	7500
160	6000	6000	6000
180	5600	5600	5600
200	4500	4500	4500
225	4100	4100	4100
250	4100	4100	4100
280	3600	3600	3600
315	3600	3000	3000
355	3600	3000	3000

* Above these limits, motors have to be specially designed.

- e - For all other frequency and/or voltage limits, additional precautions must be taken for derating, bearings, ventilation, noise, etc: please consult Leroy-Somer.

2.4.5 - Permissible starting times and locked rotor times

The starting times must remain within the limits stated below on condition that the number of starts per hour is 6 or less. Three successive cold starts and two consecutive warm starts are allowed.



Permissible motor starting time in relation to the ratio I_{st}/I_N for cold starts.

2.4.6 - Earthing (see section 2.5.5)

2.4.7 - Starting slip-ring motors

For a motor with wound slip-ring rotor, place the starting device (electrolytic starter, rheostat, etc) as close as possible to the motor and use cables with the largest possible cross-section.

Any thermal protection devices or space heaters are connected in the terminal box.

For details of the various starting devices (eg: rheostats, LS Polystart), see the relevant installation and maintenance manuals.

2.4.8 - Power factor compensation capacitors

Before any work is carried out on the motor or in the cabinet, check that the capacitors are isolated and/or discharged (read the voltage at the terminals).

2.4.9 - Motor protection devices

2.4.9.1 - On-line protection

Adjusting the thermal protection
It should be adjusted to the value of the current read on the motor nameplate for the connected mains voltage and frequency.

Thermal magnetic protection

The motors must be protected by a thermal magnetic device located between the isolating switch and the motor. These protection devices provide total protection of the motor against non-transient overloads.

This device can be accompanied by fused circuit-breakers.

Built-in direct thermal protection

For low rated currents, bimetallic strip-type protection may be used. The line current passes through the strip, which shuts down or restores the supply circuit as necessary. The design of this type of protection allows for manual or automatic reset.

2.4.9.2 - Built-in indirect thermal protection

The motors can be equipped with optional heat sensors. These sensors can be used to monitor temperature changes at "hot spots":

- overload detection
 - cooling check
 - Monitoring strategic points for maintenance of the installation
- It must be emphasized that these sensors cannot be used to carry out direct adjustments to the motor operating cycles.

Type	Operating principle	Operating curve	Breaking capacity (A)	Protection provided	Mounting Number required*
Normally closed thermostat PTO	bimetallic strip, indirectly heated, operates on opening (O) 		2.5 at 250 V with cos φ 0.4	general surveillance for non-transient overloads	Mounted on control circuit 2 or 3 in series
Normally open thermostat PTF	bimetallic strip, indirectly heated, contact on closing (F) 		2.5 at 250 V with cos φ 0.4	general surveillance for non-transient overloads	Mounted on control circuit 2 or 3 in parallel
Positive temperature coefficient thermistor PTC	Variable non-linear resistor, indirectly heated 		0	general surveillance for transient overloads	Mounted with associated relay on control circuit 3 in series
Thermocouples T (T<150 °C) K (T<1000 °C) Copper-Nickel	Peltier effect 		0	Continuous surveillance at hot spots at regular intervals	Mounted on control panels with associated reading device (or recording device) 1 per hot spot
Platinum resistance thermometer PT 100	Variable linear resistance, indirectly heated		0	high accuracy Continuous surveillance at key hot spots	Mounted on control panels with associated reading device (or recording device) 1 per hot spot

- NRT: nominal running temperature

- The NRTs are chosen according to the position of the sensor in the motor and the temperature rise class.

* The number of devices affects the protection of the windings.

Alarm and early warning

All protective equipment can be backed up by another type of protection (with different NRT's): The first device will then act as an early warning (light or sound signals given without shutting down the power circuits), and the second device will be the alarm (shutting down the power circuits).

Warning: Depending on the type of protection, the motor may remain powered-up. Ensure that the mains supply is disconnected before any work is carried out in the terminal box or in the cabinet.

Protection against condensation: space heaters

Identification: 1 red label

A glass fibre flexible resistor is fixed on 1 or 2 coil end turns. This resistor heats the machines when stopped and thus prevents condensation inside the machines.

Power supply: 230V single-phase unless otherwise specified by the customer.

If the drain plugs at the bottom of the motor have not been removed at the time of installation, they must be opened approximately every 6 months.

Warning: Check that the space heaters are powered down before any work is carried out in the terminal box or in the cabinet.

2.4.6 - Earthing (see section 2.5.5)

2.4.7 - Starting slip-ring motors

For a motor with wound slip-ring rotor, place the starting device (electrolytic starter, rheostat, etc) as close as possible to the motor and use cables with the largest possible cross-section.

Any thermal protection devices or space heaters are connected in the terminal box.

For details of the various starting devices (eg: rheostats, LS Polystart), see the relevant installation and maintenance manuals.

2.4.8 - Power factor compensation capacitors

Before any work is carried out on the motor or in the cabinet, check that the capacitors are isolated and/or discharged (read the voltage at the terminals).

2.4.9 - Motor protection devices

2.4.9.1 - On-line protection

Adjusting the thermal protection
It should be adjusted to the value of the current read on the motor nameplate for the connected mains voltage and frequency.

Thermal magnetic protection

The motors must be protected by a thermal magnetic device located between the isolating switch and the motor. These protection devices provide total protection of the motor against non-transient overloads.

This device can be accompanied by fused circuit-breakers.

Built-in direct thermal protection

For low rated currents, bimetallic strip-type protection may be used. The line current passes through the strip, which shuts down or restores the supply circuit as necessary. The design of this type of protection allows for manual or automatic reset.

2.4.9.2 - Built-in indirect thermal protection

The motors can be equipped with optional heat sensors. These sensors can be used to monitor temperature changes at "hot spots":

- overload detection
 - cooling check
 - Monitoring strategic points for maintenance of the installation
- It must be emphasized that these sensors cannot be used to carry out direct adjustments to the motor operating cycles.

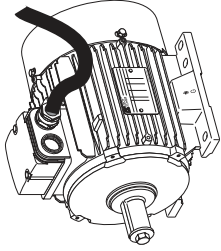
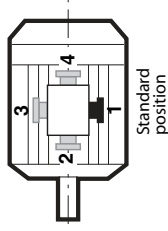
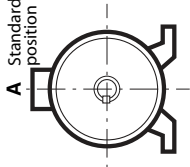
2.5 - Mains connection

2.5.1 - Terminal box

Placed as standard on the top of the motor near the drive end, for forms IM B3, B5, B14, the terminal box has IP 55 protection. Warning: The position of the terminal box cannot be easily modified, even with flanged motors, as the condensation drain holes must be at the bottom.

Cable gland (NFC 68 311 and 312 standards)

The standard position of the cable gland is on the right, seen from the drive end.



If the non-standard position of the cable gland has not been correctly specified on the order, or is no longer suitable, the symmetrical construction of the terminal box enables it to be turned in any of the 4 directions (apart from on 355 LK - 400 - 450) except for position (2) on flange-mounted motors (B5). A cable gland must never open upwards. Check that the incoming cables have bends of such a radius as to prevent water from running into the cable gland.

Tightening capacity of cable glands (NFC 68 311 and 312 standards)

Adapt the cable gland and its reducer if present to the diameter of the cable being used.

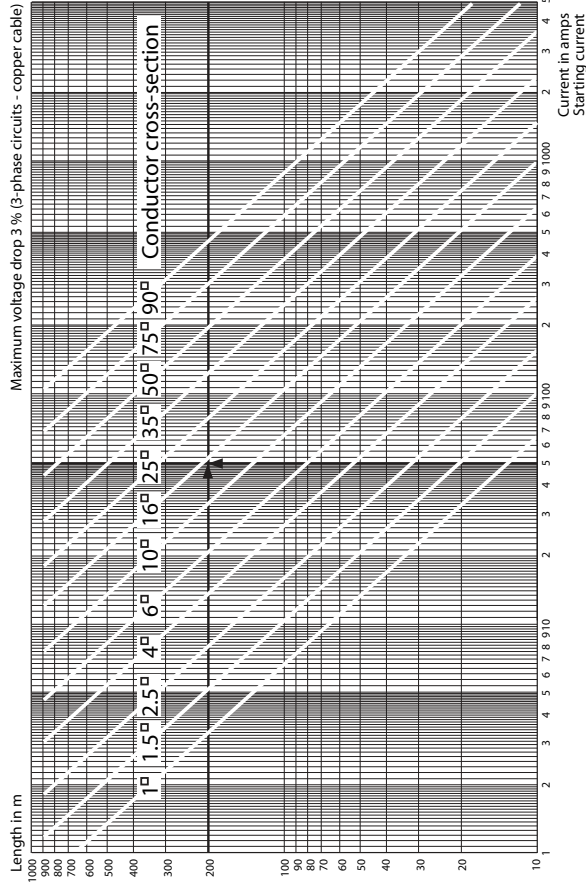
In order to preserve the motor's original IP55 protection, it is essential to tighten the cable gland seal correctly (so that it cannot be unscrewed by hand). When there are several cable glands and some are not being used, ensure that they are always covered and tighten them so that they also cannot be unscrewed by hand.

Type of cable gland	Min. cable Ø - Max. cable Ø (mm)	
	Polyamide cable gland	Brass cable gland
ISO 16	5 - 10	5.5 - 9.5
ISO 20	9.5 - 15	8.5 - 13
ISO 25	13 - 19	12 - 17
ISO 32	15 - 25	15 - 22
ISO 40	21 - 32	19.5 - 28
ISO 50	26 - 38	25.5 - 36
ISO 63	31 - 44	33 - 46

2.5.2 - Cross-section of the power supply cables

The higher the current, the greater the voltage drop in the cables (standard NFC 15-100 or end user's national standard). The voltage drop should therefore be calculated for the starting current to see if this is suitable for the application.

If the most important criterion is the starting torque (or starting time), the voltage drop should be limited to 3% maximum (the equivalent of a loss of torque of around 6 to 8%). The chart below can be used to select the conductors according to the length of the supply cables and the starting current, in order to limit the voltage drop to 3% maximum.




⚠ For motors with flying leads, the power supply cable must not be used for handling.

2.5.3 - Terminal block wiring diagram

All motors are supplied with a wiring diagram in the terminal box*.

The connector links required for coupling can be found inside the terminal box.

Single-speed motors are fitted with a block of 6 terminals complying with standard NFC 51 120, with the terminal markings complying with IEC 34 - 8 (or NFC 51 118).

 **Particular attention must be paid to the information on the nameplate in order to choose the correct type of connection for the supply voltage.**

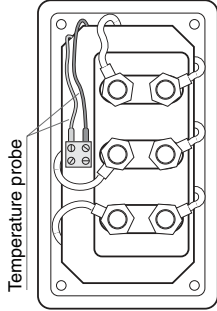
2.5.4 - Direction of rotation

When the motor is powered by U1, V1, W1 or 1U, 1V, 1W from a direct mains supply L1, L2, L3, it turns clockwise when seen from the drive end.

If 2 phases of the power supply are changed over, the motor will run in an anti-clockwise direction (make sure the motor has been designed to run in both directions of rotation).


Warning: motor with backstop: starting in the wrong direction destroys the backstop (see arrow on motor housing).


If the motor is fitted with accessories (thermal protection or space heater), these should be connected on screw dominos or terminal blocks with labelled wires (see section 2.4).



2.5.5 - Earth terminal

This is situated inside the terminal box; in some cases, the earth terminal may be situated on one of the feet or on one of the cooling fins (round motors).

It is indicated by the symbol: 

 **It is compulsory to earth the motor. Earthing must be performed in accordance with current regulations (protection of workers).**

* If required, this diagram should be obtained from the supplier, specifying the motor type and number (shown on the motor nameplate).

3 - ROUTINE MAINTENANCE

Checks after start-up

After approximately 50 hours' operation, check that the screws fixing the motor and the coupling device are still tight.


In the case of chain or belt transmission, check that the tension is correctly adjusted.

Cleaning

To ensure the motor operates correctly, remove any dust or foreign bodies which might clog the cover grille and the housing fins.

Precaution: before carrying out any cleaning operation check that the motor is completely sealed (terminal box, drain holes, etc).

Dry cleaning (vacuuming or compressed air) is always preferable to wet cleaning.

 **Always clean at reduced pressure from the centre of the motor towards the extremities to avoid introducing dust and particles under the seals.**

Draining off condensation water

Temperature variations cause condensation to form inside the motor, which must be removed before it adversely affects motor operation.

Condensation drain holes, located at the bottom of the motors (bearing in mind their operating position) are sealed with plugs which must be removed and then replaced every six months (if they were not replaced, the motor degree of protection would no longer be maintained). Clean the orifices and plugs before reassembling them.

Note: In conditions of high humidity and significant temperature variations, a shorter period is recommended. As long as it poses no risk to the motor protection, the condensation drain plugs can be removed.

3.1 - Greasing

3.1.1 - Type of grease

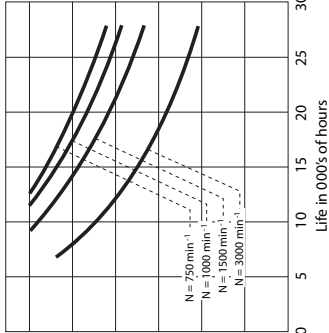
When the bearings are not greased for life, the type of grease is indicated on the nameplate.

As standard this grease is ESSO UNIREX N3 and we recommend that it is used for subsequent lubrication. **Avoid mixing greases.**

3.1.2 - Permanently greased bearings

For LS motors \leq or = 180 MT and FLS(C) \leq or = 132 M, the bearings defined offer long grease life and therefore lubrication for the lifetime of the machines. The grease life according to speed of rotation and ambient temperature is shown on the chart below.

Amb T (°C)



3.1.3 - Bearings without grease nipples


LS 180 L and LS 200 LT motors are lubricated in the factory. Lubricant lifetime under normal operating conditions is given in the table below for a machine with horizontal shaft operating at 50 Hz in ambient temperatures of 25°C and 40°C.


Polarity	7 amb.	Frame size	Frame size
2 p	40 °C	11,000	9,000
	25 °C	22,000	18,000
	40 °C	23,000	20,000
4 p	25 °C	45,000	40,000
	40 °C	28,000	26,000
	25 °C	45,000	45,000
6 p	40 °C	33,000	31,000
	25 °C	45,000	45,000

3.1.4 - Bearings with grease nipples

The bearings are lubricated in the factory

For LS motors of type 200 LT (or on request for types 160, 180, 200 LT) and for FLS(C) and FLSB motors of type 160 or above, the end shields are fitted with bearings lubricated by grease nipples such as Tecalemit-Hydraulic MB x 125.

 **The frequency of lubrication and the quantity and quality of grease are given on the nameplates and these should be referred to in order to ensure correct bearing lubrication.**

 **Even in the event of prolonged storage or downtime, the interval between 2 greasing operations should never exceed 2 years.**

3.2 - Bearing maintenance

3.2.1 - Checking the bearings

As soon as you detect any of the following on the motor:

- Abnormal noise or vibration
- Abnormal temperature rise in the bearing even though it has been lubricated correctly

the condition of the bearings must be checked.

Damaged bearings must be replaced as soon as possible to prevent worse damage to the motor and the equipment being driven.

If one bearing needs to be replaced, **the other bearing must also be replaced.**

The seals should be changed routinely when the bearings are changed.

The free bearing must allow the rotor shaft to expand (check its identification during dismantling).

3.2.2 - Reconditioning the bearings

Bearings without grease nipples

Dismantle the motor (see section 6.1); remove the old grease and clean the bearings and accessories with degreasing agent.

Fill with new grease: the correct amount of new grease for the bearing is 50% of the free space.

Bearings with grease nipples

Always begin by cleaning the waste grease channel

If using the type of grease stated on the nameplate, remove the covers and clean the grease nipple heads.

If a different grease from that on the nameplate is being used, the motor must be dismantled and the bearings and accessories cleaned with degreasing agent (carefully clean the grease inlet and outlet pipes) to remove the old grease before relubrication.

To ensure correct lubrication, fill the inner free spaces of the bearing retainers, flanges and grease pipes and 30% of the bearing free space.

Then rotate the motor shaft to distribute the grease.

Warning:

Too much grease causes the bearing to overheat (statistics show that more bearings are damaged through too much grease than too little grease).

Important note:

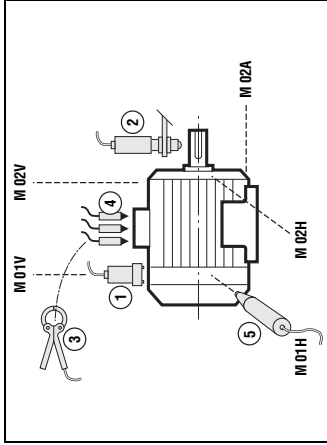
The new grease should be recently manufactured, of equivalent performance and should not contain any impurities (dust, water, etc).

4 - PREVENTIVE MAINTENANCE

Please consult LEROY-SOMER who, in its continuous search for ways to help customers, has evaluated numerous methods of preventive maintenance.

The diagram and table below give the recommended equipment to use and the ideal positions to take measurements of all parameters which can affect the operation of the machine,

such as eccentricity, vibration, state of bearings, structural problems, electrical problems, etc.



Detector	Measurement	Measurement points									
		M 01V	M 01H	M 02V	M 02H	M 02A	Shaft	E01	E02	E03	
z Accelerometer	For measuring vibrations	●	●	●	●	●					
i Photo-electric cell	For measuring speed and phase						●				
— Clamp ammeter	For measuring current (D.C. and 3-phase							●	●	●	
D Voltage probe	A.C. and D.C. voltages							●	●	●	
f Infra-red probe	For measuring temperature	●		●							

5 - TROUBLESHOOTING GUIDE

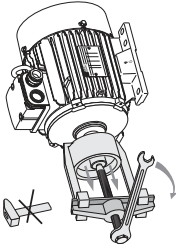
Incident	Possible cause	Remedy
Abnormal noise	Originating in motor or machine being driven ?	Uncouple the motor from the equipment being driven and test the motor on its own
Noisy motor	Mechanical cause: if the noise persists after switching off the electrical power supply	
	- Vibration	- Check that the key conforms to the type of balancing (see section 2.3)
	- Damaged bearings	- Change the bearings
	- Mechanical friction: ventilation coupling	- Check
Motor heats abnormally	Electrical cause: if the noise stops after switching off the power supply	- Check the power supply at the motor terminals
	- Normal voltage and 3 phases balanced	- Check the connection of the terminal block and the tightening of the connectors
	- Abnormal voltage	- Check the power supply line
	- Phase imbalance	- Check the winding resistance
	- Faulty ventilation	- Check the environment - Clean the fan cover and the cooling fins - Check that the fan is correctly mounted on the shaft
Motor does not start	- Faulty supply voltage	- Check
	- Terminal connection fault	- Check
	- Overload	- Check the current consumption in relation to that indicated on the motor nameplate
	- Partial short-circuit	- Check the electrical continuity of the windings and/or the installation
	- Phase imbalance	- Check the winding resistance
	No load - Mechanical seizing - Supply line disconnected	When switched off: - Check by hand that the shaft rotates freely - Check the fuses, electrical protection, starting device
	On load - Phase imbalance	When switched off: - Check the direction of rotation (phase order) - Check the resistance and continuity of the windings - Check the electrical protection
	Slip-ring motors - Rotor circuit open	- Connect the rotor to the starting device

6 - CORRECTIVE MAINTENANCE: GENERAL



First switch off and lock the power supply.

- Open the terminal box, mark the wires and their positions
- Disconnect the power supply wires
- Uncouple the motor from the equipment being driven
- Always use an extractor to remove any devices mounted on the shaft end of the motor.



6.1 - Dismantling the motor

Refer to the detailed instructions for the relevant motor range (see following pages).

It is advisable to mark the shields in relation to the stator and the direction in which the rotor fan is mounted.

6.2 - Checks before reassembly

Stator:

- Remove all dust from the stator:
- If the winding needs to be cleaned, a suitable liquid must be used: dielectric and inert on the insulating components and the external finish.
- Check the insulation (see section 2.1) and if necessary, dry it in an oven.
- Clean the spigots thoroughly, and remove all traces of knocks on the mating surfaces if necessary.

Rotor:

- Clean and check the bearing running surfaces. If they are damaged, renew the running surfaces or change the rotor.
- Check the condition of the threads, keys and their housings.

End shields:

- Clean off any traces of dirt (old grease, accumulated dust, etc).
- Clean the bearing housings and the spigot.
- If necessary, apply anti-flash varnish to the insides of the end shields.
- Carefully clean the bearing retainers and the grease valves (if these are fitted on the motor).

6.3 - Mounting the bearings on the shaft

This operation is extremely important, as the slightest indentation of a ball on the bearing tracks would cause noise and vibration.

Lightly lubricate the running surfaces of the shaft.

There are a number of ways of mounting the bearings correctly:

- Cold state: The bearings must be mounted without any impact, using a spanner (do not use a hammer). The force applied must not be transferred to the bearing track. You should therefore use the internal cage for support (taking care not to press on the seal shield for sealed bearings).

- Hot state: Heat the bearing to between 80 and 100 °C: in a dryer, an oven or on a heating plate.
(A blowtorch or an oil bath must never be used).

After dismantling and reassembling a bearing, all the spaces between the seals and labyrinth seals must be filled with grease in order to prevent the entry of dust and the rusting of machined parts.

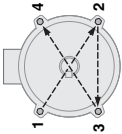
See detailed instructions for the relevant motor ranges in the following pages.

6.4 - Reassembling the motor

Be careful to replace the stator in its original position, so that the stack of laminations is centred correctly (generally with the terminal box facing forward) and the water drain holes are positioned correctly if they are on the housing.

Tightening the tie rods

These must be tightened diagonally, to the torque indicated (see below).



Tie rod tightening torque		
Type	Rodscrew Ø	Tightening torque N.m ± 5%
56	M4	2.5
63	M4	2.5
71	M4	2.5
80	M5	4
90	M5	4
100	M5 or M6	4
112	M5 or M6	4
132	M7	10
160	M8	18
180 MT/LR	M8	18
180 L	M10	25
200	M10	25
225 ST/MR	M10	25
225 MK	M12	44
250	M12	44
280	M12	44
315	M12	44
315 LK/355	M16	100
355 LK/400	M16	100
450	M16	100

6.5 - Reassembling the terminal box

Reconnect all the power supply wires in accordance with the diagram or markings made before dismantling.

To ensure the box is properly sealed: check that the cable glands on the box and the cable(s) have been retightened, and ensure that the seal has been correctly positioned before closing. For terminal boxes equipped with a horn (part no. 89 on the exploded views) or/and a cable gland support plate, ensure that the seal has been correctly positioned before closing. Check that the terminal box components are tightened correctly.

Note: It is advisable to test the motor at no load


- If necessary, repaint the motor.
- Mount the transmission device on the motor shaft extension and reinstall the motor on the machine to be driven.

7 - POSITION OF LIFTING RINGS

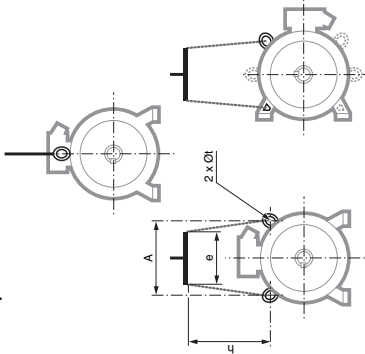
 Position of lifting rings for lifting the motor only (not connected to the machine)

Labour regulations stipulate that all loads over 25 kg must be fitted with lifting devices to facilitate handling.

The positions of the lifting rings and the minimum dimensions of the loading bars are given below in order to help with preparation for handling the motors. If these precautions are not followed, there is a risk of warping or crushing some equipment such as the terminal box, protective cover or drip cover.

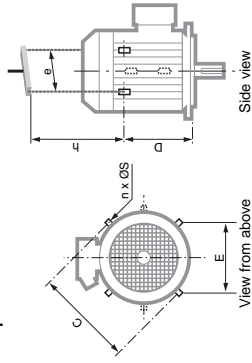
 Motors intended for use in the vertical position may be delivered on a pallet in the horizontal position. When the motor is pivoted, the shaft must under no circumstances be allowed to touch the ground, as the bearings may be irreparably damaged. Moreover, additional special precautions must be taken, as the integral motor lifting rings are not designed for pivoting the motor.

• Horizontal position



Type	Horizontal position			
	A	e min	h min	Øt
100	120	200	150	9
112	120	200	150	9
132	160	200	150	9
160	200	160	110	14
180 MR	200	160	110	14
180 L	200	260	150	14
200	270	260	165	14
225 ST/MT	270	260	150	14
225 M	360	265	200	30
250	360	380	200	30
280	360	380	500	30
315 ST	310	380	500	17
315 M/L	360	380	500	23
355	310	380	500	23
400	735	710	500	30
450	730	710	500	30

• Vertical position



Type	Vertical position						
	C	E	D	n	ØS	e min*	h min
160	320	200	230	2	14	320	350
180 MR	320	200	230	2	14	320	270
180 L	390	265	290	2	14	390	320
200	410	300	295	2	14	410	450
225 ST/MT	410	300	295	2	14	410	450
225 M	480	360	405	4	30	540	350
250	480	360	405	4	30	540	350
280 S	480	360	485	4	30	590	550
280 M	480	360	585	4	30	590	550
315 ST	590	-	590	2	17	630	550
315 M/L	695	-	765	2	24	695	550
355	755	-	835	2	24	755	550
400	810	350	1135	4	30	810	600
450	960	400	1170	4	30	960	750

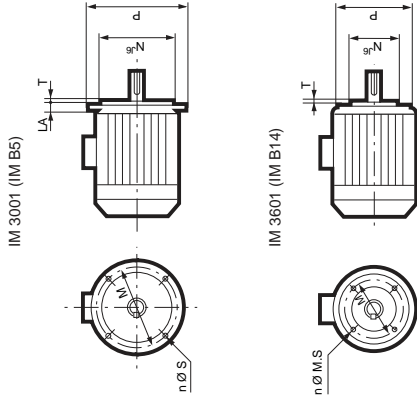
* If the motor is fitted with a drip cover, allow an additional 50 to 100 mm to avoid damaging it when the load is swung.

8 - SPARE PARTS

When ordering spare parts, you must indicate the complete motor type, its serial number and the information given on the nameplate (see section 1).

Part numbers can be found on the exploded views and their descriptions in the parts list (section 6).

In the case of flange mounted motors, indicate the type of flange and its dimensions (see below).



Our extensive network of service centres can dispatch the necessary parts without delay.

To ensure that our motors operate correctly and safely, we recommend the use of original manufacturer spare parts.

In the event of failure to comply with this advice, the manufacturer cannot be held responsible for any damage.

DISMANTLING AND REASSEMBLY PROCEDURES

9 - LS cage motors	24 to 33
10 - FLS-FLSC cage motors	34 to 45
11 - FLSC-FLSLB slip-ring motors	46 to 53

9 - LS CAGE MOTORS

9.1 - LS 56 to LS 160 MP/LR motors

9.1.1 - Dismantling

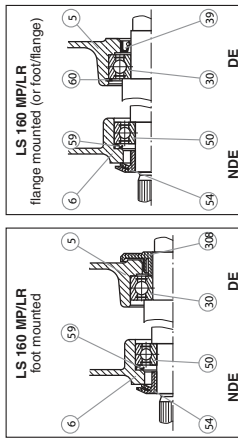
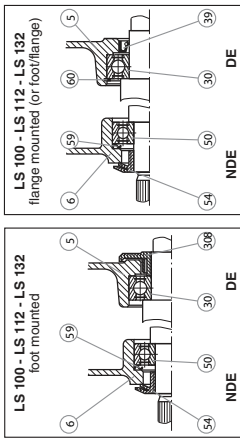
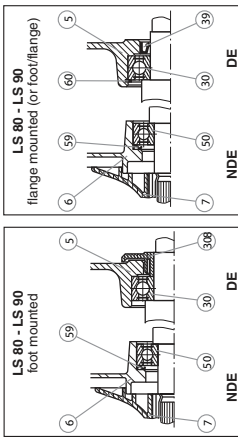
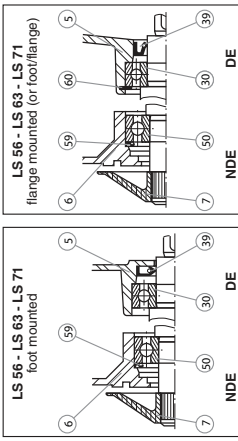
- Remove the screws (27) and then take off the cover (13).
- Pull out the fan (7) using a hub remover or 2 levers (for example, 2 screwdrivers) diametrically opposed to one another, using the shield (6) for support.
- Remove the tie rods (14).
- Remove the key (21).
- Using a wooden mallet, tap the shaft on the fan side in order to loosen the drive end shield (5).
- Remove the rotor shaft (3) and the DE shield (5) taking care not to knock the winding.
- Remove the shield on the fan side (6).
- Take out the preloading washer (59) and the seal of the NDE shield (54) for LS 100, 112 and 132 motors.
- Remove the circlip (60) from flanged motors using angled circlip pliers.
- Separate the DE shield from the rotor shaft.
- The shaft can then be seen with its 2 bearings and, if appropriate, the circlip.
- Use a bearing remover to take out the bearings, taking care not to knock the running surfaces of the shaft.

9.1.2 - Reassembling motors without circlip

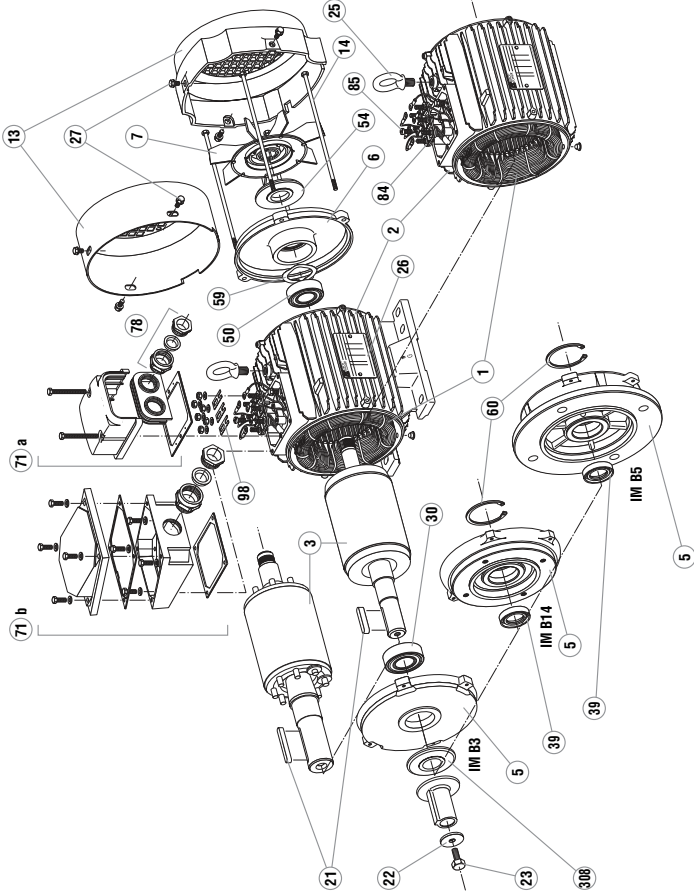
- Mount the bearings on the rotor shaft.
- Insert the rotor into the stator taking all possible precautions not to knock the winding.
- Mount the DE shield (5).
- For LS 56, 63, 71 motors, mount the seal (39) with grease beforehand.
- Place the preloading washer (59) in the bearing housing, then mount the NDE shield (6).
- Place the tie rods (14) in position and tighten the nuts diagonally up to the recommended torque (see section 6.4).
- Mount the shield seals (39, 54, 308) with grease.
- Mount the fan (7) using a drift to bed it into position.
- Check that the motor turns freely by hand and that there is no radial play.
- Replace the cover (13) and fix it with the screws (27).

9.1.3 - Reassembling motors with flange and circlip

- Mount the DE bearing (30) in the flange (5) using the outer slip-ring for support.
- Fit the circlip (60).
- Mount this assembly on the rotor (3) using the inner slip-ring for support.
- Mount the NDE bearing on the rotor.
- Insert the rotor (3) and shield (5) assembly in the stator taking care not to knock the winding.
- Place the preloading washer (59) in the bearing housing, then mount the NDE shield (6).
- Place the tie rods (14) in position and tighten the nuts diagonally up to the recommended torque (see section 6.4).
- Mount the shield seals (39, 54, 308) with grease.
- Mount the fan (7) using a drift to bed it into position.
- Check that the motor turns freely by hand and that there is no axial play.
- Replace the cover (13) and fix it with the screws (27).
- Replace the key (21).



LS 56 to LS 160 MP/LR



LS 56 to LS 160 MP/LR

Ref.	Description	Ref.	Description
1	Wound stator	22	Shaft end washer
2	Frame	23	Shaft extension screw
3	Rotor	25	Lifting ring
5	DE shield	26	Nameplate
6	NDE shield	27	Fan cover screw
7	Fan	30	Drive end bearing
13	Fan cover	39	Drive end seal
14	Tie rods	50	Non drive end bearing
21	Shaft extension key	54	Non drive end seal
		59	Preloading (wavy) washer
		60	Circlip
		71 a	Plastic terminal box (< or = frame size 112)
		71 b	Metal terminal box
		78	Cable gland
		84	Terminal block with terminals
		85	Set screw
		98	Connectors
		308	Labyrinth seal

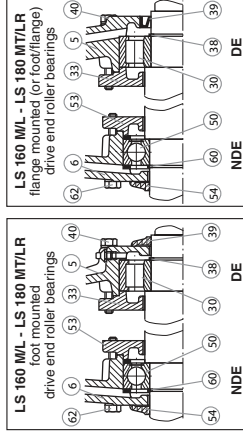
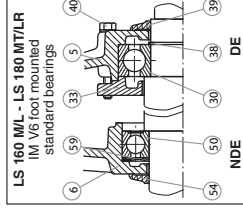
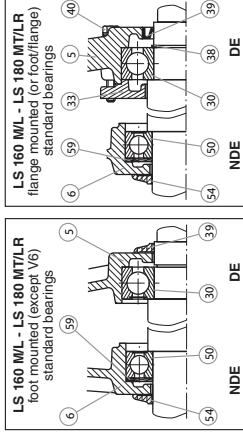
9.2 - LS 160 M/L, LS 180 MT/LR motors

9.2.1 - Dismantling

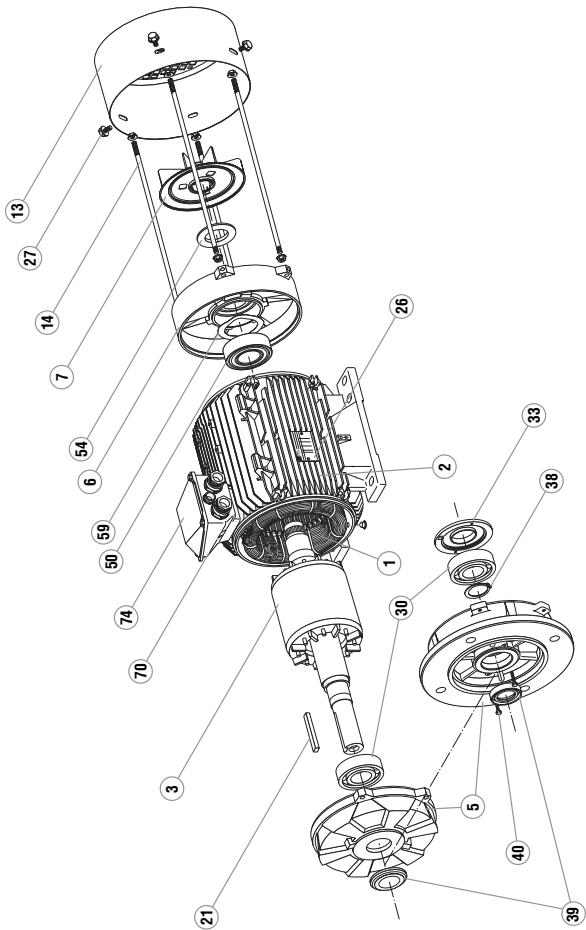
- Remove the screws (27) and then take off the cover (13).
- Pull out the fan (7) using a hub remover or 2 levers diametrically opposed to one another, using the shield (6) for support.
- Take out the key (21) and remove the seals (39 and 54 for foot mounted motors) (54 for flange mounted motors).
- Unscrew the tie rods (14) then remove them.
- Unscrew the inner bearing retainer (33) fixing screws (40) when using a flange mounted motor or if the drive end bearing is locked.
- Using a bronze drift, remove the shields (5 and 6) by tapping gently on the shield bosses. Recover the preloading washer (59).
- Remove the circlip (38) if necessary (flange mounted motor).
- Remove the rotor (3) from the stator (1) taking care not to touch the winding.
- Take out the bearings (30) and (50) using a bearing remover, while protecting the end of the shaft extension with a washer. Avoid knocking the running surfaces of the shaft.

9.2.2 - Reassembly

- See section 6.1 before reassembly.
- If necessary, insert the inner bearing retainer (33) at the rotor drive end, then mount new bearings on the shaft, see section 6.3 mounting bearings.
- Mount the circlip (38) for flange mounted motors.
- Insert the rotor (3) in the stator (1) taking care not to knock the winding.
- Position the preloading washer (59) with a small amount of grease in the back of the bearing cage of the NDE shield (6), then remount the NDE shield (6), positioning it on the stator.
- If there is a bearing retainer (33), screw a rod with the same thread diameter as the screws (40) into one of the tapped holes of the bearing retainer to maintain its angular position when remounting the DE shield (5).
- When there is a flange, mount a new seal (39) with the spring facing outwards.
- Remount the shield (5) taking care to allow for the positioning of a bearing retainer if used.
- Place the tie rods (14) in position and tighten the nuts diagonally up to the recommended torque (see section 6.1).
- If necessary, fix the bearing retainer (33) with its own screws.
- Mount the shield seals with grease: (54 at the non drive end) (39 at the drive end for foot mounted motors).
- Mount the fan (7) using a drift to bed it into position.
- Check that the rotor turns freely by hand (that there is no axial play if there is a locked end shield).
- Replace the cover (13) and fix it with the screws (27).
- Replace the key (21).



LS 160 M/L, LS 180 MT/LR



LS 160 M/L, LS 180 MT/LR

Ref.	Description	Ref.	Description
1	Wound stator	14	Tie rods
2	Frame	21	Key
3	Rotor	26	Nameplate
5	DE shield	27	Fan cover screw
6	NDE shield	30	Drive end bearing
7	Fan	33	Inner DE bearing retainer
13	Fan cover	38	Drive end bearing circlip
		39	Drive end seal
		40	Cover fixing screw
		50	Non drive end bearing
		54	Non drive end seal
		59	Preloading (wavy) washer
		70	Terminal box
		74	Terminal box lid

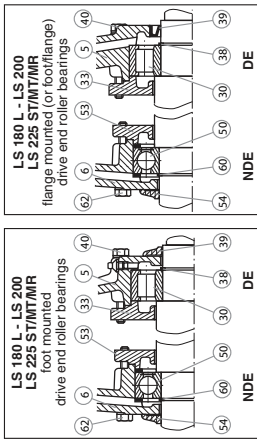
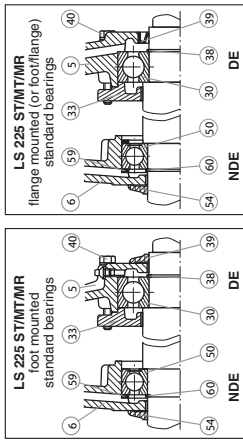
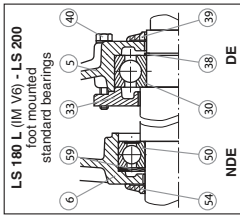
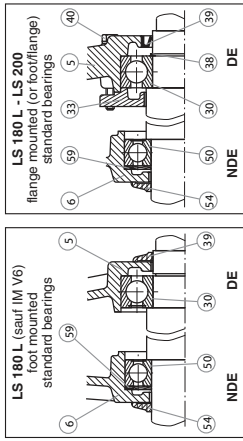
9.3 - LS 180 L, LS 200, LS 225 ST/MT/MR motors

9.3.1 - Dismantling

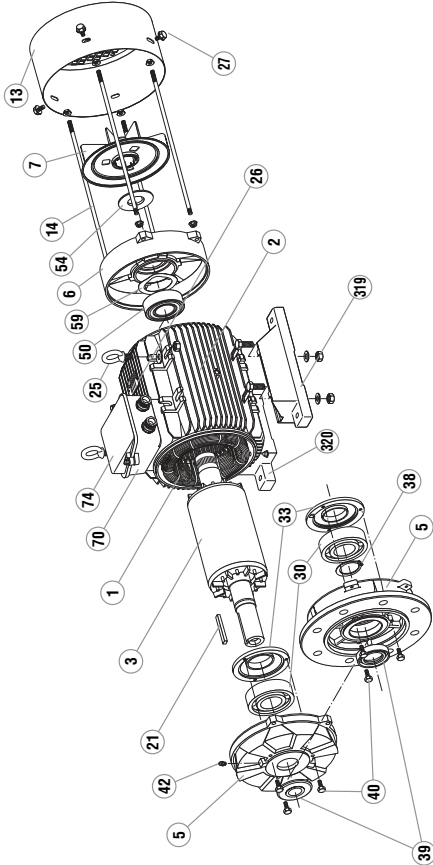
- Remove the screws (27) and then take off the cover (13).
- Pull out the fan (7) using a hub remover or 2 levers diametrically opposed to one another, using the shield (6) for support.
- Take out the key (21) and remove the seals (39 and 54 for foot mounted motors) (54 for flange mounted motors).
- Unscrew the tie rods (14) then remove them.
- Unscrew the inner bearing retainer (33) fixing screws (40) when using a flange mounted motor or if the drive end bearing is locked.
- Using a bronze drift, remove the shields (5 and 6) by tapping gently on the shield bosses. Recover the preloading washer (59).
- Remove the circlip (38) if appropriate.
- Remove the rotor (3) from the stator (1) taking care not to touch the winding.
- Take out the bearings (30) and (50) using a bearing remover, while protecting the end of the shaft extension with a washer. Avoid knocking the running surfaces of the shaft.

9.3.2 - Reassembly

- See section 6.1 before reassembly.
- If necessary, insert the inner bearing retainer (33) at the rotor drive end, then mount new bearings on the shaft, see section 6.3 mounting bearings.
- Fill with new grease: the correct amount of new grease for the bearing is 50% of the free space.
- Mount the circlip (38) if necessary.
- Insert the rotor (3) in the stator (1) taking care not to knock the winding.
- Position the preloading washer (59) with a small amount of grease in the back of the bearing cage of the NDE shield (6), then remount the NDE shield (6), positioning it on the stator.
- If there is a bearing retainer (33), screw a rod with the same thread diameter as the screws (40) into one of the tapped holes of the bearing retainer to maintain its angular position when remounting the DE shield (5).
- When there is a flange, mount a new seal (39) with the spring facing outwards.
- Remount the shield (5) taking care to allow for the positioning of a bearing retainer if used.
- Place the tie rods (14) in position and tighten the nuts diagonally up to the recommended torque (see section 6.1).
- If necessary, fix the bearing retainer (33) with the screws (40).
- Mount the shield seals with grease: (54 at the non drive end) (39 at the drive end for foot mounted motors).
- Mount the fan (7) using a drift to bed it into position.
- Check that the rotor turns freely by hand (that there is no axial play if there is a locked end shield).
- Replace the cover (13) and fix it with the screws (27).
- Replace the key (21).



LS 180 L, LS 200, LS 225 ST/MT/MR



LS 180 L, LS 200, LS 225 ST/MT/MR

Ref.	Description	Ref.	Description
1	Wound stator	25	Lifting ring
2	Frame	26	Nameplate
3	Rotor	27	Fan cover screw
5	DE shield	30	Drive end bearing
6	NDE shield	33	Inner DE bearing retainer
7	Fan	38	Drive end bearing circlip
13	Fan cover	39	Drive end seal
14	Tie rods	40	Cover fixing screw
21	Key	42	Grease nipples (optional for LS 180 L, LS

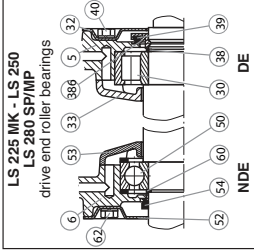
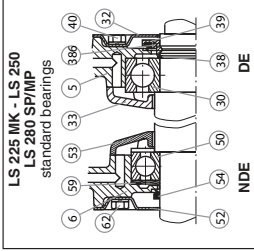
9.4 - LS 225 MK, LS 250, LS 280 SP/MP motors

9.4.1 - Dismantling

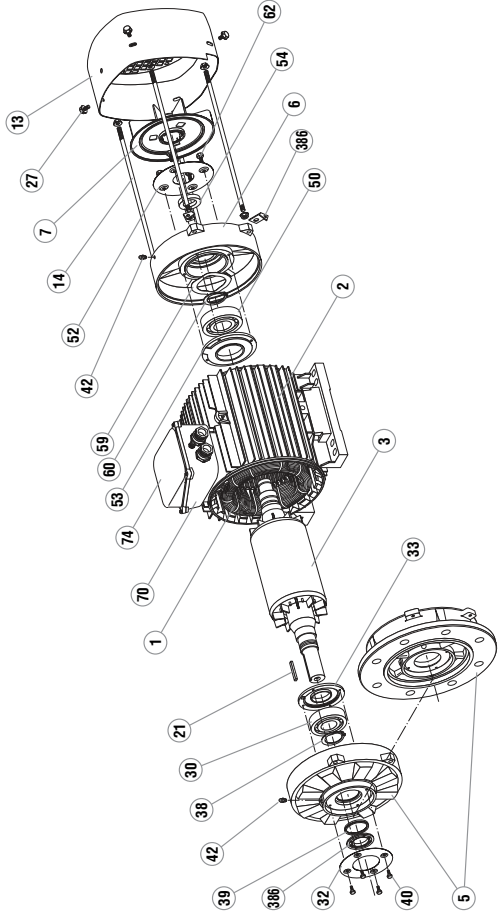
- Remove the screws (27), the grease nipple (42) and its extension, then take off the cover (13).
- Pull out the fan (7) using a hub remover or 2 levers diametrically opposed to one another, using the shield (6) for support.
- Take out the key (21).
- Unscrew the tie rods (14) then remove them.
- Unscrew the DE bearing retainer (33) fixing screws (40) and NDE bearing retainer (52) and (53) fixing screws (62), and remove them.
- Using a bronze drift, remove the shields (5 and 6) by tapping gently on the shield bosses. Recover the preloading washer (59).
- Remove circlips (38) and (60).
- Remove the rotor (3) from the stator (1), taking care not to touch the winding with the inner bearing retainer.
- Take out the bearings (30) and (50) using a bearing remover, while protecting the end of the shaft extension with a washer. Avoid knocking the running surfaces of the shaft.
- The bearings are removed either separately or with the bearing retainers: to avoid damaging the bearing retainers, heat the outer bearing retainer to make it easier to dismantle (the bearing should be discarded).

9.4.2 - Reassembly

- See section 6.1 before reassembly.
- Insert the inner bearing retainer (33) at the rotor drive end and the inner bearing retainer (53) at the non drive end.
- Add new grease: the correct amount of new grease for the bearing is 50% of the free space.
- Mount the new bearings on the shaft, see section 6.3 on mounting bearings.
- Mount the circlips (38) and (60).
- Insert the rotor (3) in the stator (1) taking care not to knock the winding.
- Screw a rod with the same thread diameter as the screws (40 and 62) into one of the tapped holes of the bearing retainers (33 and 53) to maintain their position and that of the grease nipple when remounting the shields (5 and 6).
- Position the preloading washer (59) with a small amount of grease in the back of the bearing cage of the NDE shield (6), then remount the NDE shield (6), positioning it on the stator.
- Fit the seal (54), the outer bearing retainer (52) and the locking screws (62) for the bearing retainers (52, 53).
- Mount the shield (5) taking care to allow for the positioning of the bearing retainer.
- Put the tie rods (14) in place, not forgetting the feet of the protective cover (380), tighten the nuts diagonally without locking them so that the feet of the protective cover can be positioned when it is mounted.
- At the drive end fit the seal (39) and its support (386), insert the bearing retainer (32) and the locking screws (40) for the bearing retainer.
- Mount the fan (7) using a drift to bed it in position or by heating the hub of the aluminium fan to approximately 100°C.
- Check that the motor turns freely by hand and that there is no axial play.



LS 225 MK, LS 250 and LS 280 SP/MP



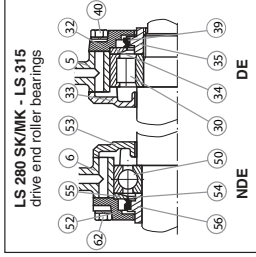
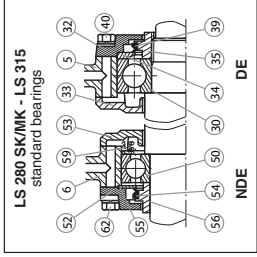
LS 225 MK, LS 250 and LS 280 SP/MP

Ref.	Description	Ref.	Description
1	Wound stator	30	Drive end bearing
2	Frame	32	Outer DE bearing retainer
3	Rotor	33	Inner DE bearing retainer
5	DE shield	38	Drive end bearing circlip
6	NDE shield	39	Drive end seal
7	Fan	40	Cover fixing screw
13	Fan cover	42	Grease nipples
14	Tie rods	50	Non drive end bearing
21	Key	52	Outer NDE bearing retainer
27	Fan cover screw	53	Inner NDE bearing retainer

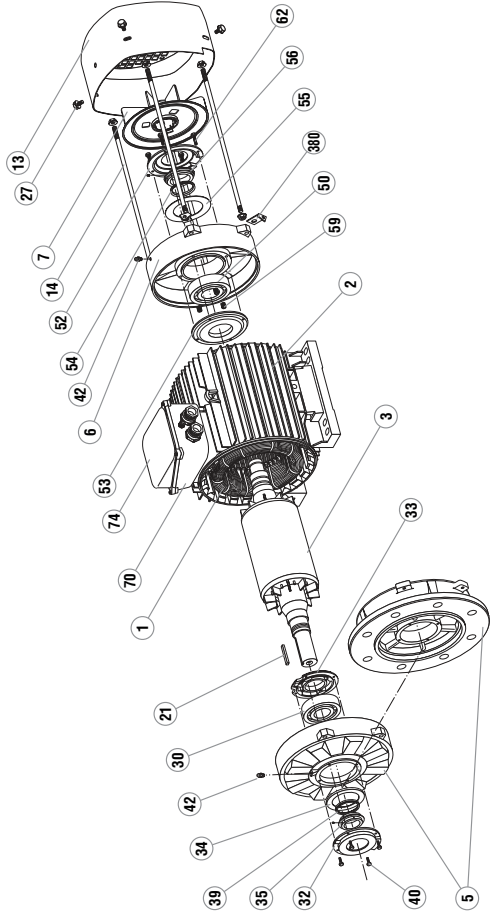
9.5 - LS 280 SK/MK, LS 315 motors

9.5.1 - Dismantling

- Remove the screws (27), the grease nipple (42) and its extension, then take off the cover (13).
- Pull out the fan (7) using a hub remover or 2 diametrically opposed levers, using the shield (6) for support; for an aluminium fan, heat the hub to approximately 100°C before removing it.
- Take out the key (21).
- Unscrew the tie rods (14) then remove them.
- Unscrew the DE bearing retainer (33) fixing screws (40) and NDE bearing retainer (32) and (52) fixing screws (62), and remove the bearing retainers.
- Unscrew the "CHC" screws of the mobile valves (35 and 56) then unscrew the valves using a hook spanner or a conical bronze drift; unscrew the valves by hand and remove them. The valves hold the seal (39 and 54).
- Remove the fixed valves (34 and 35) from the bearing housings.
- Using a bronze drift, remove the shields (5 and 6) by tapping gently on the shield bosses.
- Check that the bearing retainer (53) is smaller in diameter than the stator, otherwise remove the bearing (50) as per the following instructions.
- Remove the rotor (3) from the stator (1) at the drive end, taking care not to touch the winding with the inner bearing retainer if there is no internal turbine.
- Take out the bearings (30) and (50) using a bearing remover, while protecting the end of the shaft extension with a washer. Avoid knocking the running surfaces of the shaft.
- The bearings are removed either separately or with the bearing retainers (33 and 53); to avoid damaging the bearing retainers, heat the outer bearing ring (the bearing should be discarded).
- Recover the preloading washer or springs (59) from the bearing retainer (53).
- 9.5.2 - Reassembly
 - See section 6.1 before reassembly.
 - Insert the inner bearing retainer (33) at the rotor drive end and the inner bearing retainer (53) at the non drive end, not forgetting to insert the preloading springs (59).
 - Add new grease: the correct amount of new grease for the bearing is 50% of the free space.
 - Mount the new bearings (30 and 50) on the shaft, see section 6.3 on mounting bearings.
 - Insert the rotor (3) in the stator (1) taking care not to knock the winding.
 - Screw a rod with the same thread diameter as the screws (40) and (62) into one of the tapped holes of the bearing retainers (33) and (53) to maintain the position of the grease nipple when remounting the shields (5 and 6).
 - Check that the preloading springs are properly installed.
 - Fit the NDE shield (6), positioning it on the stator, then mount the fixed valve (55) in the shield bearing housing.
 - Mount the mobile valve (56) by either screwing it or locking it, having carefully installed the seal (54) on the valve.



LS 280 SK/MK and LS 315



LS 280 SK/MK and LS 315			
Ref.	Description	Ref.	Description
1	Wound stator	30	Drive end bearing
2	Frame	32	Outer DE bearing retainer
3	Rotor	33	Inner DE bearing retainer
5	DE shield	34	DE fixed grease valve
6	NDE shield	35	DE mobile grease valve
7	Fan	39	Drive end seal
13	Fan cover	40	Cover fixing screw
14	Tie rods	42	Grease nipples
21	Key	50	Non drive end bearing
27	Fan cover screw	52	Outer NDE bearing retainer

10 - FLS-FLSC CAGE MOTORS

10.1 - FLS-FLSC 80 to 132 motors

10.1.1 - Dismantling

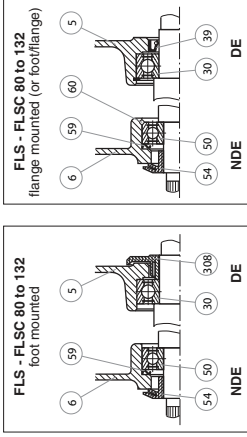
- Remove the screws (27) and then take off the cover (13).
- Pull out the fan (7) using a hub remover or 2 levers (for example, 2 screwdrivers) diametrically opposed to one another, using the shield (6) for support.
- Remove the tie rods (14).
- Remove the key (21).
- Using a wooden mallet, tap the shaft on the fan side in order to loosen the drive end shield (5).
- Remove the rotor shaft (3) and the DE shield (5) taking care not to knock the winding.
- Remove the shield on the fan side (6).
- Recover the preloading (wavy) washer (59) and the NDE shield seal (54).
- Remove the circlip (60) from flanged motors using angled circlip pliers.
- Separate the DE shield from the rotor shaft.
- The shaft can then be seen with its 2 bearings and, if appropriate, the circlip.
- Use a bearing remover to take out the bearings, taking care not to knock the running surfaces of the shaft.

10.1.2 - Reassembling motors without circlip

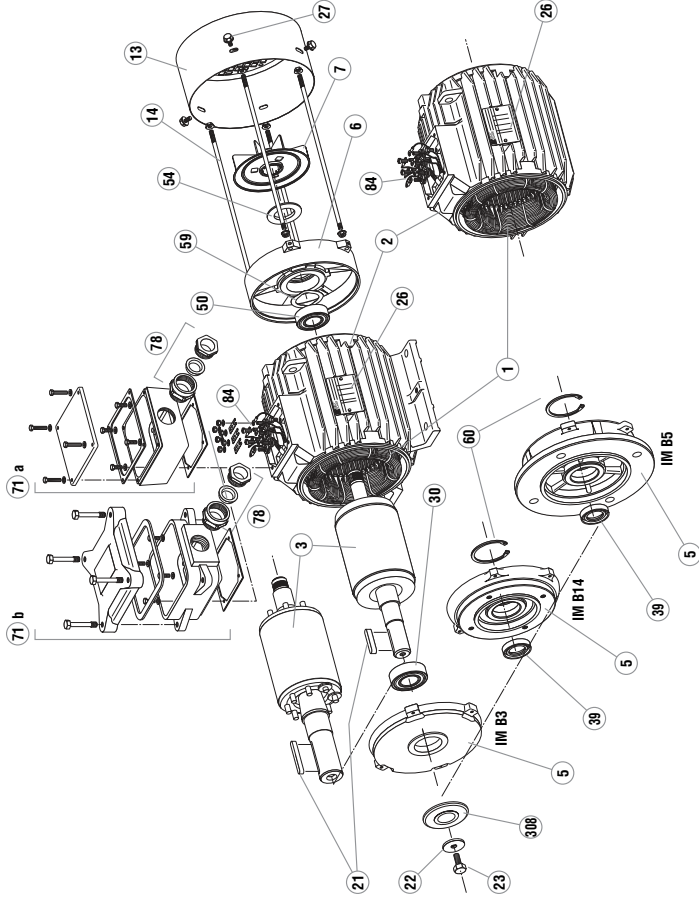
- Mount the bearings on the rotor shaft.
- Insert the rotor into the stator taking all possible precautions not to knock the winding.
- Mount the DE shield (5).
- Place the preloading washer (59) in the bearing housing, then mount the NDE shield (6).
- Place the tie rods (14) in position and tighten the nuts diagonally up to the recommended torque (see section 6.4).
- Mount the shield seals (39, 54, 308) with grease.
- Mount the fan (7) using a drift to bed it into position.
- Check that the motor turns freely by hand and that there is no radial play.
- Replace the cover (13) and fix it with the screws (27).

10.1.3 - Reassembling motors with flange and circlip

- Mount the DE bearing (30) in the flange (5) using the external slip-ring for support.
- Fit the circlip (60).
- Mount this assembly on the rotor (3) using the inner slip-ring for support.
- Mount the NDE bearing on the rotor.
- Insert the rotor (3) and shield (5) assembly in the stator taking care not to knock the winding.
- Place the preloading washer (59) in the bearing housing, then mount the NDE shield (6).
- Place the tie rods (14) in position and tighten the nuts diagonally up to the recommended torque (see section 6.4).
- Mount the shield seals (39, 54, 308) with grease.
- Mount the fan (7) using a drift to bed it into position.
- Check that the motor turns freely by hand and that there is no axial play.
- Replace the cover (13) and fix it with the screws (27).
- Replace the key (21).



FLS-FLSC 80 to 132



FLS-FLSC 80 to 132

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	21	Shaft extension key	54	Non drive end seal
2	Housing	22	Shaft extension washer	59	Preloading (wavy) washer
3	Rotor	23	Shaft end screw	60	Circlip
5	DE shield	26	Nameplate	71a	FLS terminal box
6	NDE shield	27	Fan cover screw	71b	FLSC terminal box
7	Fan	30	Drive end bearing	78	Cable gland
13	Fan cover	39	Drive end seal	84	Terminal block with terminals
14	Tie rods	50	Non drive end bearing	308	Labyrinth seal

10.2 - FLS-FLSC 160 and 180 motors

10.2.1 - Dismantling the NDE shield

- Amount of grease for ball bearings:
- Frame size 160: DE = 40 cm³/NDE = 20 cm³
 - Frame size 180: DE = 50 cm³/NDE = 35 cm³ (except for 180 MR NDE = 20 cm³)
- Remove the fixing screws (27) and then take off the cover (13).
 - Take out the fan (7).
 - Remove the fixing screws (273) from the NDE shield (6).
 - Using two levers or a flexible hammer, disengage the NDE shield (6) taking care not to place it askant. Remove the shield by sliding it along the shaft. The seal (54) follows behind and is no longer usable.
 - Recover the preloading washer (59) which should be replaced in its housing.

10.2.2 - Dismantling the DE shield

- Remove the fixing screws (270) from the DE shield.
- Using an appropriate lifting tool, take out the rotor (3) + DE shield (5) assembly, without knocking the winding.
- Remove the fixing screws (40) from the inner DE bearing retainer (33).
- Take out the key (21).
- Using two levers or a flexible hammer, disengage the DE shield (5) from the rotor (3) taking care not to place it askant.
- Remove the shield by sliding it along the shaft. The seal (39) follows behind and is no longer usable.

10.2.3 - Changing the antifriction bearings

- Remove the bearings (30) and (50) with an appropriate tool, protecting the end of the shaft extension. Avoid knocking the running surfaces of the shaft.
- Change the bearings in accordance with the instructions described in the General information in section 6 (shrink-fitting only).

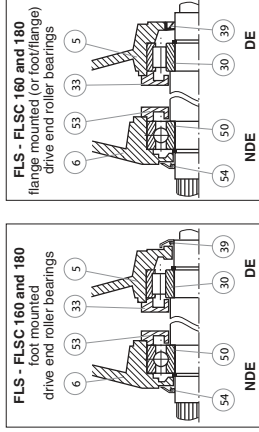
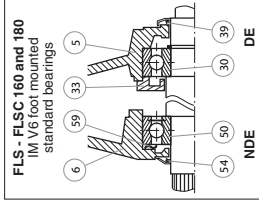
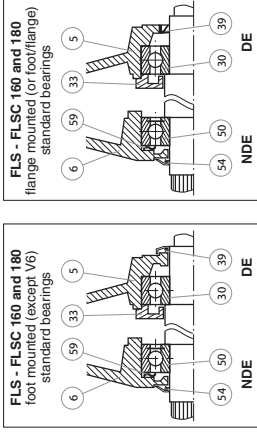
IMPORTANT: Before undertaking any of these procedures, read the "CHECKS BEFORE REASSEMBLY" section.

10.2.4 - Reassembly

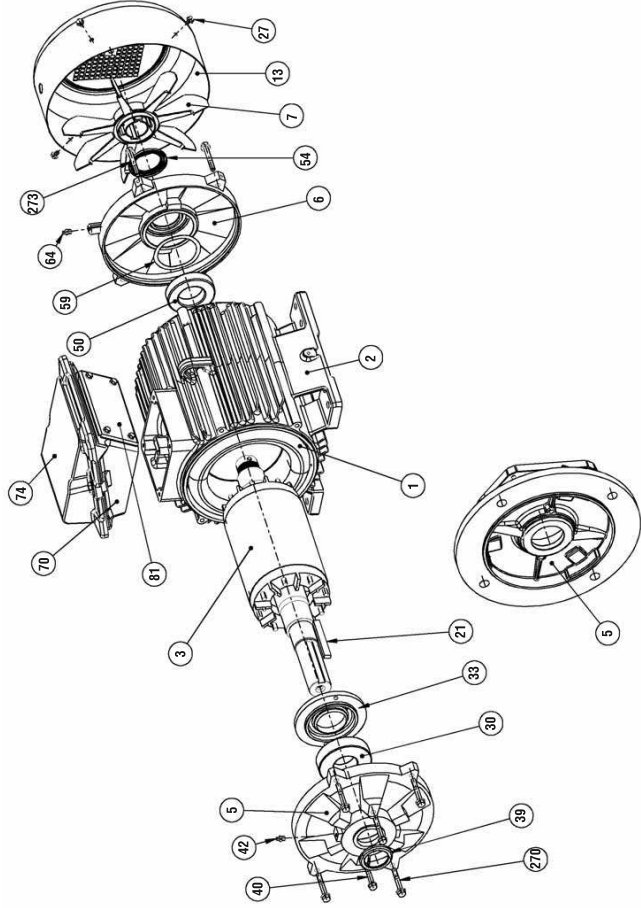
- Mount the bearings on the rotor shaft (not forgetting the inner DE bearing retainer (33)).
- Slide the DE shield (5) onto the bearing (30).
- Replace the fixing screws (40) on the inner bearing retainer (33).
- Insert the rotor + shield assembly in the stator without knocking the winding.
- Present the shields, grease nipples facing upwards, not forgetting the preloading washer (59) at the non-drive end. Slide them into position.
- Fit the shields firmly in place.
- Check that the rotor turns freely by hand.

From now on, we recommend checking at every step that the rotor turns freely by hand before continuing to the next instruction.

- Replace the shield fixing screws (270) and (273).
- Use a drift to fit a new seal (54).
- Replace the fan (7).
- Replace the cover (13) and reinsert the fixing screws (27).
- Use a drift to fit the new seal (39).
- Lubricate the DE and NDE antifriction bearings, turning the shaft by hand.



FLS-FLSC 160 and 180



FLS-FLSC 160 and 180

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	27	Fan cover screw	59	NDE preloading (wavy) washer
2	Housing	30	Drive end bearing	64	NDE grease nipple
3	Rotor	33	Inner DE bearing retainer	70	Stator terminal box
5	DE shield	39	DE seal	74	Terminal box lid
6	NDE shield	40	Cover fixing screw	81	Cable gland support plate
7	Fan	42	DE grease nipple	270	DE shield fixing screw
13	Fan cover	50	Non drive end bearing	273	NDE shield fixing screw
21	Shaft extension key	54	NDE seal		

10.3 - FLS-FLSC 200 to 225 ST motors

10.3.1 - Dismantling the NDE shield

- Remove the fixing screws (27) and then take off the cover (13).
- Take out the fan (7).
- Remove the fixing screws from the inner NDE bearing retainer (53).
- Remove the fixing screws (273) from the NDE shield (6).
- Using two levers or a flexible hammer, disengage the NDE shield (6) taking care not to place it askant. Remove the shield by sliding it along the shaft. The seal (54) follows behind and is no longer usable.
- Put the dismantled components to one side and recover the preloading washer (59), which should be replaced in its housing.

10.3.2 - Dismantling the DE shield

- Dismantle the DE shield without removing the rotor (3). To do this:
- Remove the fixing screws (40) from the inner DE bearing retainer (33).
- Remove the fixing screws (270) from the DE shield (5).
- Remove the fixing screws from the inner DE bearing retainer (33).
- Take out the key (21).
- Using two levers or a flexible hammer, disengage the DE shield (5) taking care not to place it askant.
- Remove the shield by sliding it along the shaft. The seal (39) follows behind and is no longer usable.

10.3.3 - Changing the antifriction bearings

- Using an appropriate lifting tool, take out the rotor without knocking the windings.
- Remove the bearings (30) and (50) with an appropriate tool, protecting the end of the shaft extension. Avoid knocking the running surfaces of the shaft.
- The moving parts of the grease valve (35) for the drive end and (56) for the non-drive end follow.
- Put the components to one side (55) - (56) for the non-drive end and (34) - (35) for the drive end.
- Change the bearings in accordance with the instructions described in the General information in section 6 (shrink-fitting only).

IMPORTANT: Before undertaking any of these procedures, read the "CHECKS BEFORE REASSEMBLY" section.

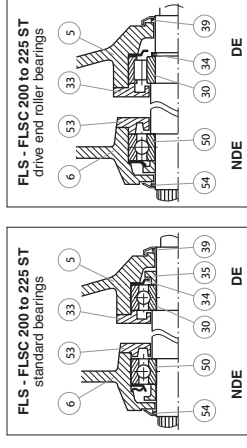
10.3.4 - Reassembly

- Mount the DE bearing (30) on the rotor shaft (take care not to forget the inner bearing retainer (33)), and also the NDE bearing (50) if and only if the stator inner Ø allows the inner NDE bearing retainer (53) to pass through.
- Install the fixed part of the grease valves (no. (55) for the non-drive end and (34) for the drive end).
- Shrink-fit the moving part of the grease valves (no. (56) for the non-drive end and (35) for the drive end). Make absolutely sure that it is resting on the inner slip-ring.
- Insert the rotor into the stator taking care not to knock the winding. Install the NDE bearing if this has not already been done.

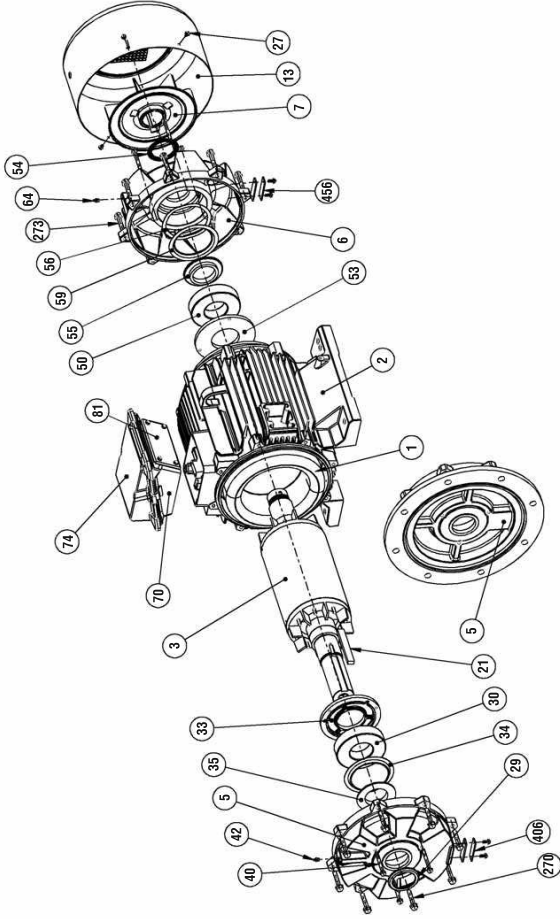
- Present the shields, grease nipples facing upwards. Begin with the DE shield (5). Fix a dowel pin in one of the inner bearing retainer (33) tapped holes so that the grease inlet pipes fully correspond. Slide it into position.
 - End with the NDE shield (6). Fix a dowel pin in one of the inner bearing retainer (53) tapped holes so that the grease inlet pipes fully correspond.
 - Lift the rotor slightly and fit the shields onto the housing.
- From now on, we recommend checking at every step that the rotor turns freely by hand before continuing to the next instruction.**
- Replace the shield fixing screws (270) and (273).
 - Replace the fixing screws on the inner bearing retainers (33) and (53).
 - Use a drift to fit a new seal (54).
 - Replace the fan (7).
 - Use a drift to fit a new seal (39).
 - Replace the cover (13) and reinsert the fixing screws (27).
 - Lubricate the DE and NDE antifriction bearings, turning the shaft by hand.

Amount of grease for ball bearings:

- DE and NDE = 100 cm³



FLS-FLSC 200 to 225 ST



FLS-FLSC 200 to 225 ST

Ref.	Description	Ref.	Description
1	Wound stator	33	Inner DE bearing retainer
2	Housing	34	Fixed part of DE grease valve
3	Rotor	35	Moving part of DE grease valve
5	DE shield	39	DE seal
6	NDE shield	40	Cover fixing screw
7	Fan	42	Grease nipple
13	Fan cover	50	Non drive end bearing
21	Shaft extension key	53	Inner NDE bearing retainer
27	Fan cover screw	54	NDE seal
30	Drive end bearing	55	Fixed part of NDE grease valve

10.4 - FLS-FLSC 225 M to 280 motors

10.4.1 - Dismantling the NDE shield

- Remove the fixing screws (27) and then take off the cover (13).
- Remove the shaft extension screw if necessary.
- Take out the fan (7).
- Remove the fixing screws from the inner NDE bearing retainer (53).
- Remove the fixing screws (273) from the NDE shield (6).
- Remove the fan key if appropriate.
- Using two levers or a flexible hammer, disengage the NDE shield (6) taking care not to place it aslant. Remove the shield by sliding it along the shaft.
- Put the dismantled components to one side and recover the preloading washer (59), which should be replaced in its housing.

10.4.2 - Dismantling the DE shield

- Dismantle the DE shield without removing the rotor (3). To do this:
 - Remove the fixing screws (270) from the DE shield (5).
 - Remove the fixing screws (40) from the DE internal cover (33).
 - Take out the key (21).
 - Using two levers or a flexible hammer, disengage the DE shield (5) taking care not to place it aslant.
 - Remove the shield by sliding it along the shaft.

10.4.3 - Changing the antifriction bearings

- Using an appropriate lifting tool, take out the rotor without knocking the winding.
- Take off the DE circlip (38).
- Remove the bearings (30) and (50) with an appropriate tool, protecting the end of the shaft extension. Avoid knocking the running surfaces of the shaft.
- Change the bearings in accordance with the instructions described in the General information in section 6 (shrink-fitting only).

IMPORTANT: Before undertaking any of these procedures, read the "CHECKS BEFORE REASSEMBLY" section.

10.4.4 - Reassembly

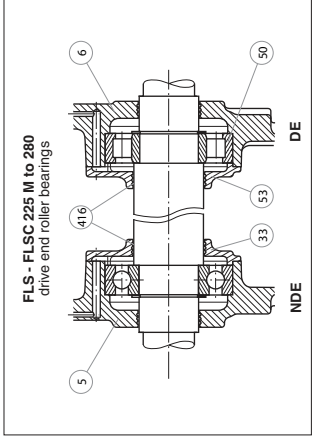
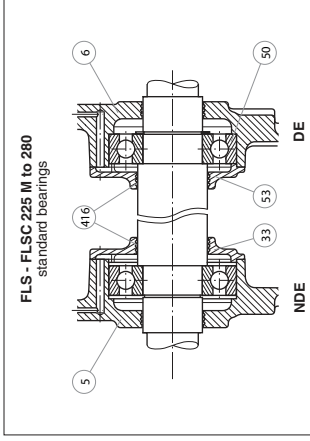
- Mount the DE bearing (30) on the rotor shaft (take care not to forget the inner bearing retainer (33) and the circlip (38)), and also the NDE bearing (50) if and only if the stator inner Ø allows the inner NDE bearing retainer (53) to pass through.
- Insert the rotor into the stator taking care not to knock the winding. Install the NDE bearing if this has not already been done.
- Fill the decompression grooves (416) located in the shaftway with grease.
- Present the shields, grease nipples facing upwards. Begin with the DE shield (5). Fix a dowel pin in one of the inner bearing retainer (33) tapped holes **so that the grease inlet pipes fully correspond**.
- End with the NDE shield (6). Fix a dowel pin in one of the inner bearing retainer (53) tapped holes **so that the grease inlet pipes fully correspond**.
- Lift the rotor slightly and fit the shields in place.

From now on, we recommend checking at every step that the rotor turns freely by hand before continuing to the next instruction.

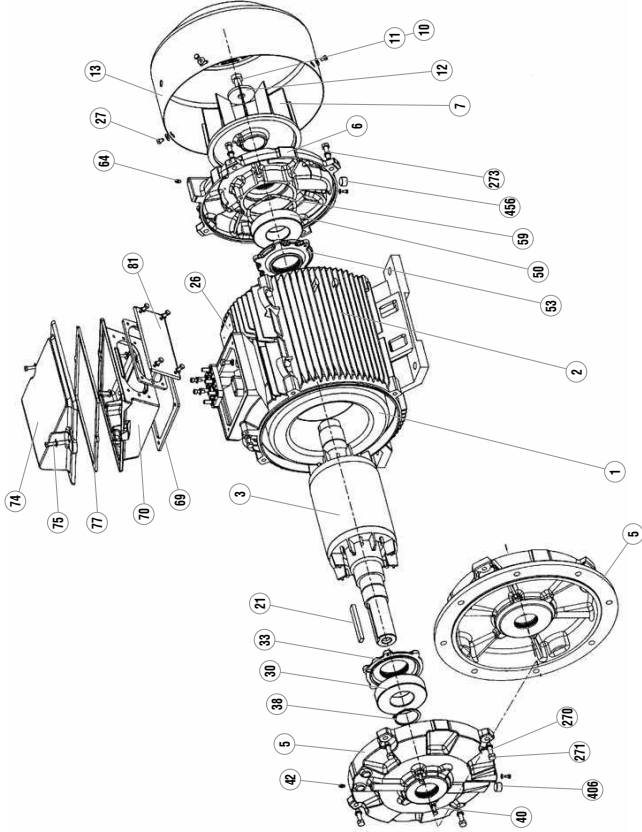
- Replace the shield fixing screws (270) and (273).
- Insert the fixing screws on the inner bearing retainers (33) and (53). Replace the AZ washers to ensure a perfect seal.
- Replace the fan key if appropriate.
- Replace the fan (7).
- Replace the shaft extension screw if necessary.
- Replace the cover (13) and reinsert the fixing screws (27).
- Lubricate the DE and NDE antifriction bearings, turning the shaft by hand.

Amount of grease for ball bearings:

- Frame size 225 - 250: DE and NDE = 120 cm³
- Frame size 280: DE = 170 cm³/NDE = 120 cm³



FLS-FLSC 225 M to 280



FLS-FLSC 225 M to 280

Ref.	Description	Ref.	Description
1	Wound stator	26	Nameplate
2	Housing	27	Fan cover screw
3	Rotor	30	Drive end bearing
5	DE shield	33	Inner DE bearing retainer
6	NDE shield	38	DE bearing circlip
7	Fan	40	Cover fixing screw
10	Turbine or fan screw (280 - 4p)	42	DE grease nipple
11	Lock washer (not shown) (280 - 4p)	50	Non drive end bearing
12	Lock washer (280 - 4p)	53	Inner NDE bearing retainer
13	Fan cover	59	NDE preloading (wavy) washer
21	Shaft extension key	64	NDE grease nipple
		406	DE grease valve cover plate (plug)
		456	NDE grease valve cover plate (plug)

10.5 - FLS-FLSC 315 to 355 LD motors

Note:

- There is a stirrer at the drive end of the 315 M up to the 355.
- Types 315 M and L, and all 355s have fixed NDE bearings: the preloading washer (59) is therefore at the drive end.
- Type 315 S has a fixed DE bearing, and the preloading washer (59) is therefore at the non-drive end.
- This should be taken into account during dismantling/ reassembly operations.

10.5.1 - Dismantling the NDE shield

- Remove the grease nipple extension (65).
- Remove the fixing screws (27) and then take off the cover (13).
- Remove the screws and washer from the shaft extension.
- Take out the fan (7).
- Take out the fan key (not shown) and the moving part of the grease valve (56).
- Remove the fixing screws from the inner NDE bearing retainer (53).
- Remove the fixing screws (273) from the NDE shield (6).
- Using two levers or a flexible hammer, disengage the NDE shield (6). Remove the shield by sliding it along the shaft.
- Put the dismantled components to one side and recover the preloading washers (59), which should be replaced in their housing (for the 315 S).

10.5.2 - Dismantling the DE shield

- Dismantle the DE shield without removing the rotor (3). To do this:
 - Take out the key (21).
 - Heat the moving part of the DE grease valve (35). Unscrew and remove it.
 - Remove the fixing screws from the inner DE bearing retainer (33).
 - Remove the fixing screws (270) from the DE shield.
 - Using two levers or a flexible hammer, disengage the DE shield (5) taking care not to place it aslant.
 - Remove the shield by sliding it along the shaft.
 - Place the dismantled components to one side and recover part no. (35) which should be replaced in its housing, along with the preloading washers (59) (for the 315 M to 355 LD).

10.5.3 - Changing the antifriction bearings

- Using an appropriate lifting tool, take out the rotor without knocking the winding.
- Remove the bearings (30) and (50) with an appropriate tool, protecting the end of the shaft extension. Avoid knocking the running surfaces of the shaft.
- Change the bearings in accordance with the instructions described in the General information in section 6 (shrink-fitting only).

IMPORTANT: Before undertaking any of these procedures, read the **"CHECKS BEFORE REASSEMBLY"** section.

10.5.4 - Reassembly

- Mount the DE bearing (30) on the rotor shaft (take care not to forget the inner bearing retainer (33)!), and also the NDE bearing (50) and the inner NDE bearing retainer (53).
- Insert the rotor in the stator taking care not to knock the winding.

- Don't forget to replace the preloading washers (59) in their housing.
- Begin with the fixed bearing (see above). Fix a dowel pin in one of the inner bearing retainer tapped holes **so that the grease inlet pipes fully correspond**.
- End with the non-fixed bearing. Fix a dowel pin in one of the inner bearing retainer tapped holes **so that the grease inlet pipes fully correspond**.
- Lift the rotor slightly and fit the shields in place.

From now on, we recommend checking at every step that the rotor turns freely by hand before continuing to the next instruction.

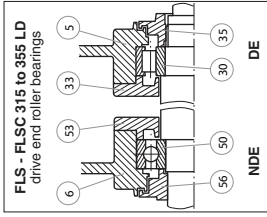
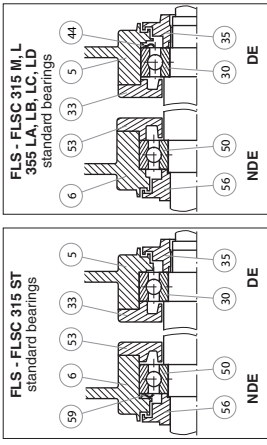
- Replace the shield fixing screws (270) and (273).
- Replace the inner bearing retainer fixing screws (33) and (53).
- Refit the moving part of the grease valve (56).
- Replace the fan (7) with its key.
- Replace the shaft extension screw with its washer.
- Replace the cover (13).
- Coat the thread of the moving part of the DE grease valve (35) with anti-vibration adhesive. Screw it tight.
- Lubricate the DE and NDE bearings.

Amount of grease for ball bearings:

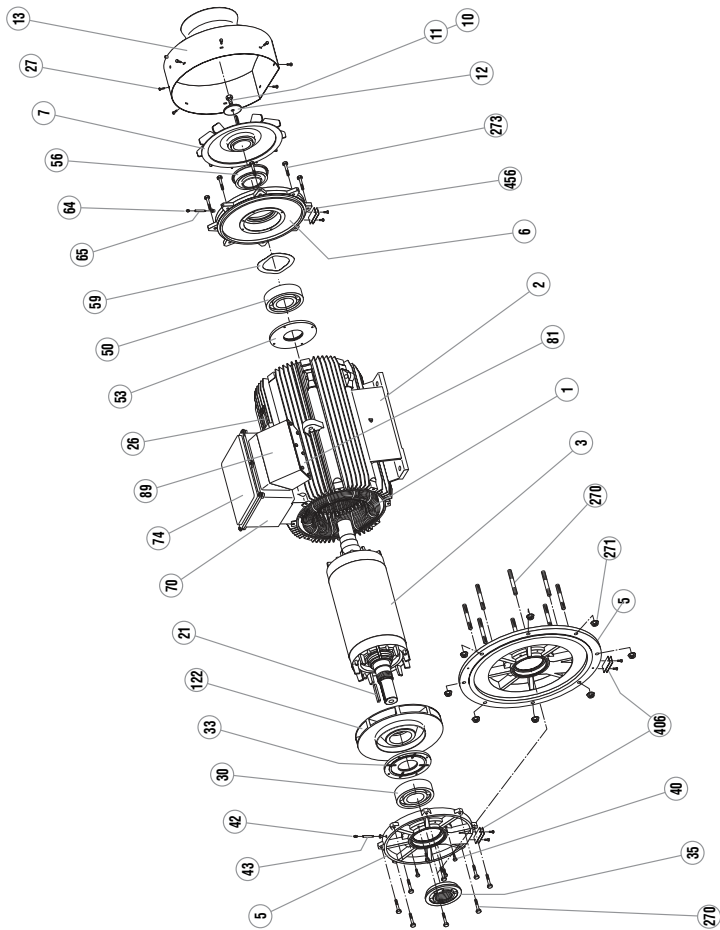
- frame size 315S: DE and NDE = 235 cm³/frame size
- 315 M/L: DE and NDE = 335 cm³/frame size 355: DE and NDE = 445 cm³

Amount of grease for DE roller bearings:

- frame size 315S: 350 cm³/frame size 315 M/L: 500 cm³/frame size 355: 665 cm³



FLS-FLSC 315 to 355 LD



FLS-FLSC 315 to 355 LD

Ref.	Description	Ref.	Description
1	Wound stator	27	Fan cover screw
2	Housing	30	Drive end bearing
3	Rotor	33	Inner DE bearing retainer
5	DE shield	35	Moving part of DE grease valve
6	NDE shield	40	Cover fixing screw
7	Fan	42	DE grease nipple
10	Turbine or fan screw	43	Extension for DE grease nipple
11	Lock washer (not shown)	50	Non drive end bearing
12	Lock washer	53	Inner NDE bearing retainer
13	Fan cover	56	Moving part of NDE grease valve
21	Shaft extension key	59	NDE preloading (wavy) washer
26	Nameplate	64	NDE grease nipple

10.6 - FLS-FLSC 355 LK to 450 motors

10.6.1 - Dismantling the NDE shield

- Remove the grease nipple extension (65).
- Remove the fixing screws (27) and then take off the cover (13). There is a tapped hole into which you can screw a lifting ring to make it easier to remove.
- Remove the fan screw and washer (10 -12) and the lock washer (11).

- Take out the fan (7).
- Take out the fan key (not shown) and the moving part of the grease valve (56).
- Remove the fixing screws from the inner NDE bearing retainer (53).

- Remove the fixing screws (273) from the NDE shield.
- Using two levers, disengage the NDE shield (6). Screw a lifting ring in place of one of the cover fixing screws. Turn the shield so that the ring is at the top. Remove the shield with a lifting block by sliding it along the shaft.

10.6.2 - Dismantling the DE shield

- Dismantle the DE shield without removing the rotor (3). To do this:

- Take out the key (21).
- Heat the moving part of the DE grease valve (35). Unscrew and remove it.
- Remove the fixing screws from the inner DE bearing retainer (33).

- Remove the fixing screws (270) from the DE shield.
- Using two levers or a flexible hammer, disengage the DE shield (5) taking care not to place it aslant.

- Remove the shield by sliding it along the shaft.
- Put the dismantled components to one side and recover the moving part of the DE grease valve (35), which should be replaced in its housing.

10.6.3 - Changing the antifriction bearings

- The operation can be performed without removing the rotor.
- Push back the inner bearing retainers (53) and (33) to make it easier to insert the bearing extractor tool. Take out the bearings.

IMPORTANT: Before undertaking any of these procedures, read the "CHECKS BEFORE REASSEMBLY" section.

10.6.4 - Reassembly

- Mount the DE bearing (30) and NDE bearing (50) on the rotor shaft.

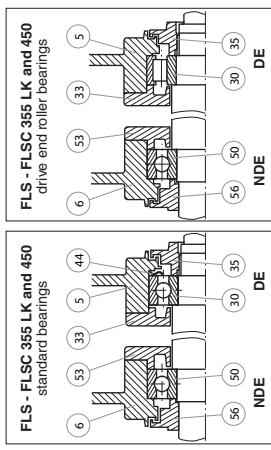
- Don't forget to replace the preloading washers (59) in their housing.

- Start with the NDE shield (6). Fix a dowel pin in one of the inner bearing retainer (53) tapped holes so that the grease inlet pipes fully correspond.

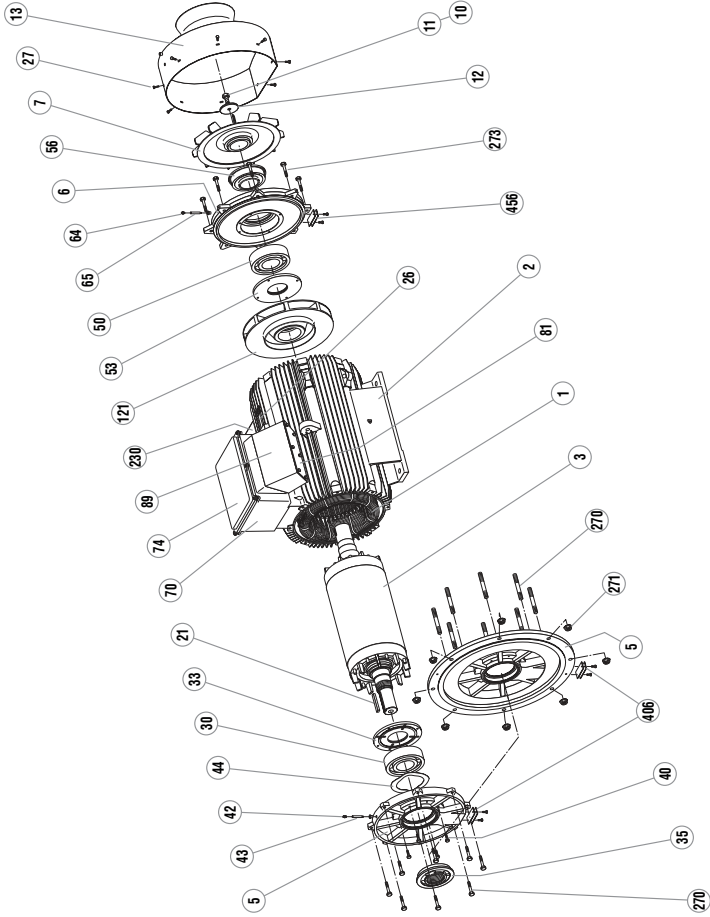
- End with the DE shield (5). Fix a dowel pin in one of the inner bearing retainer (33) tapped holes so that the grease inlet pipes fully correspond.

- Engage the shield on the bearing. Turn it so that the grease nipple is brought to the top.

- Slide it into position.
- Lift the rotor slightly and fit the shields onto the housing.
- Replace the shield fixing screws.
- Replace the cover fixing screws.
- Refit the moving part of the grease valve.



FLS-FLSC 355 LK to 450



FLS-FLSC 355 LK to 450

Ref.	Description	Ref.	Description
1	Wound stator	27	Fan cover screw
2	Housing	30	Drive end bearing
3	Rotor	33	Inner DE bearing retainer
5	DE shield	35	Moving part of DE grease valve
6	NDE shield	40	Cover fixing screw
7	Fan	42	DE grease nipple
10	Turbine or fan screw	43	Extension for DE grease nipple
11	Lock washer (not shown)	44	DE preloading (wavy) washer
12	Lock washer	50	Non drive end bearing
13	Fan cover	53	Inner NDE bearing retainer
21	Shaft extension key	56	Moving part of NDE grease valve
26	Nameplate	64	NDE grease nipple

11 - FLSB-FLSLB SLIP-RING MOTORS

11.1 - FLSB-FLSLB 160, 180 and 200

motors

11.1.1 - Dismantling the NDE shield

- Remove the cover (13).
 - Pull out the pin (not marked) while holding the fan.
 - Take out the fan (7).
 - Remove the fixing screws from the inner NDE bearing retainer (53).
 - Remove the inspection door (140).
 - Disconnect the wires on the brush holders (149).
 - Remove the fixing screws (136) from the NDE shield.
 - Using two levers or a flexible hammer, disengage the NDE shield (136) taking care not to place it aslant.
- Remove the shield by sliding it along the NDE bearing (50).

11.1.2 - Dismantling the DE shield

- Take out the key (21) from the shaft.
- Remove the labyrinth seal (47). This part cannot be dismantled without damaging it. Replace it with a new part.
- Remove the fixing screws from the inner DE bearing retainer.
- Remove the fixing screws from the DE shield (5).
- Using two levers or a flexible hammer, disengage the DE shield (5) taking care not to place it aslant. Remove the shield by sliding it along the DE bearing (30).

11.1.3 - Changing the antifriction bearings

- Using an appropriate lifting tool, take out the rotor without knocking the winding.
- Remove the DE bearing (30) and NDE bearing (50) with an appropriate tool, protecting the end of the shaft extension. Avoid knocking the running surfaces of the shaft.
- Change the bearings in accordance with the instructions described under General information in section 6 (shrink-fitting only).

11.1.4 - Monitoring the set of brushes and slip-rings

- Regular servicing (see section 3.3).
- Check the state of the slip-rings (patina - colour - scratches - micropitting). The slip-rings can be precision ground if necessary. Leave at least 5/10 depth of thread free of dust.
- Check the state of the brushes. The minimum acceptable height is 20 to 25 mm high.

11.1.5 - Reassembly

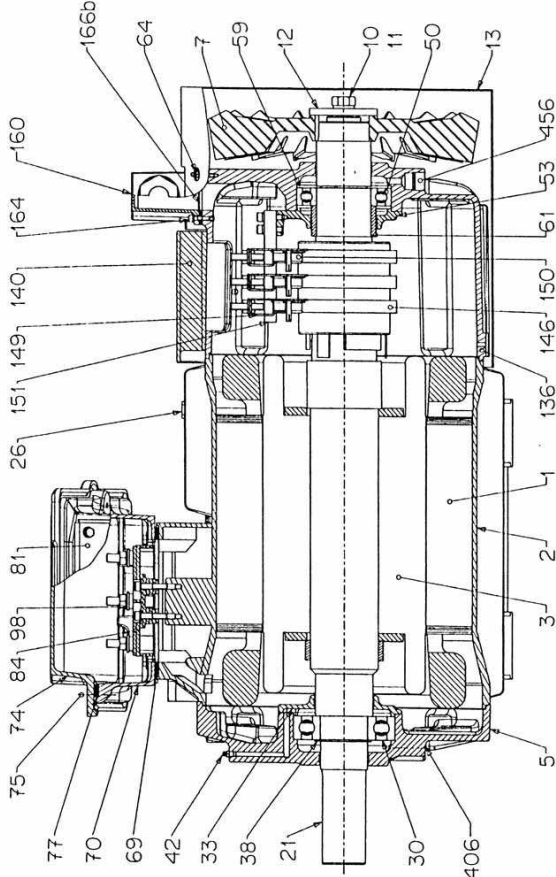
- Mount the DE bearing (30) on the rotor shaft (take care not to forget the inner bearing retainer, and also the NDE bearing (50) and the inner bearing retainer (53)).
- Insert the rotor in the stator taking care not to knock the winding.
- Present the shields, grease nipples facing upwards.
- Start with the NDE shield (50). Fix a dowel pin in one of the inner bearing retainer (53) tapped holes **so that the grease inlet pipes fully correspond**.
- Slide it into position.

- End with the DE shield (30). Fix a dowel pin in one of the inner bearing retainer tapped holes **so that the grease inlet pipes fully correspond**.
- Lift the rotor slightly and fit the shields onto the housing.

From now on we recommend checking, at every step, that the rotor turns freely by hand before continuing to the next instruction.

- Replace the shield fixing screws (not marked).
- Reconnect the wires on the brush holders and replace the inspection door.
- Replace the fan (7) with its rotation stop pin.
- Replace the cover (13) and the fixing screws.
- Lubricate the DE and NDE antifriction bearings in accordance with the information on the nameplate.

FLSB-FLSLB 225 and 250



FLSB-FLSLB 225 and 250			
Ref.	Description	Ref.	Description
1	Wound stator	38	DE bearing circlip
2	Housing	42	DE grease nipple
3	Wound rotor	50	NDE bearing
5	DE shield	53	Inner NDE bearing retainer
7	Fan	59	NDE preloading (wavy) washer
10	Fan screw	61	NDE spacer ring
11	Lock washer	64	NDE grease nipple
12	Lock washer	69	Stator terminal box seal
13	Fan cover	70	Stator terminal box
21	Shaft extension key	74	Stator terminal box lid
26	Nameplate	75	Stator terminal box screws
30	Drive end bearing	77	Stator terminal box lid seal
33	Inner DE bearing retainer	81	Cable gland support plate
		84	Terminal block with terminals
		98	Stator connector links
		136	Slip-ring housing
		140	Inspection door
		146	Commutator
		149	Brush holder
		150	Brushes
		151	Brush holder rod
		160	Rotor cable gland plate
		164	Rotor cable gland plate screw
		166b	Rotor cable gland plate seal
		406	DE grease valve cover plate
		456	NDE grease valve cover plate

11.3 - FLSB-FLSLB 280 to 355 motors

11.3.1 - Dismantling the NDE shield

- Remove the cover (13).
- Unscrew the SKF nut (9).
- Take out the fan (7).
- Take out both the inner and outer NDE bearing retainer fixing screws (52) and (53).
- Pull out the outer bearing retainer (52).
- Remove the inspection door (140).
- Disconnect the wires on the brush holders (149).
- Remove the fixing screws (136) from the NDE shield.
- Using two levers or a flexible hammer, disengage the NDE shield (136) taking care not to place it aslant.
- Remove the shield by sliding it along the NDE bearing (50).

11.3.2 - Dismantling the DE shield

- Take out the key (21) from the shaft.
- Remove both the fixing screws from the DE labyrinth seal (47).
- Remove the labyrinth seal (47).
- Take out both the inner and outer NDE bearing retainer screws (32) and (33).
- Pull out the outer bearing retainer (32).
- Remove the fixing screws from the DE shield (5).
- Using two levers or a flexible hammer, disengage the DE shield (5) taking care not to place it aslant. Remove the shield by sliding it along the DE bearing (30).

11.3.3 - Changing the antifriction bearings

- Using an appropriate lifting tool, take out the rotor without knocking the winding.
- Unscrew the DE bearing SKF nut (30).
- Remove the DE bearing (30) and NDE bearing (50) with an appropriate tool, protecting the end of the shaft extension. Avoid knocking the running surfaces of the shaft.
- Change the bearings in accordance with the instructions described under General information in section 6 (shrink-fitting only).

11.3.4 - Checking the set of brushes and slip-rings

- Regular servicing (see section 3.3).
- Check the state of the slip-rings (patina - colour - scratches - micropitting). The slip-rings can be precision ground if necessary. Leave at least 5/10 depth of thread free of dust.
- Check the state of the brushes. The minimum acceptable height is 20 to 25 mm high.

11.3.5 - Reassembly

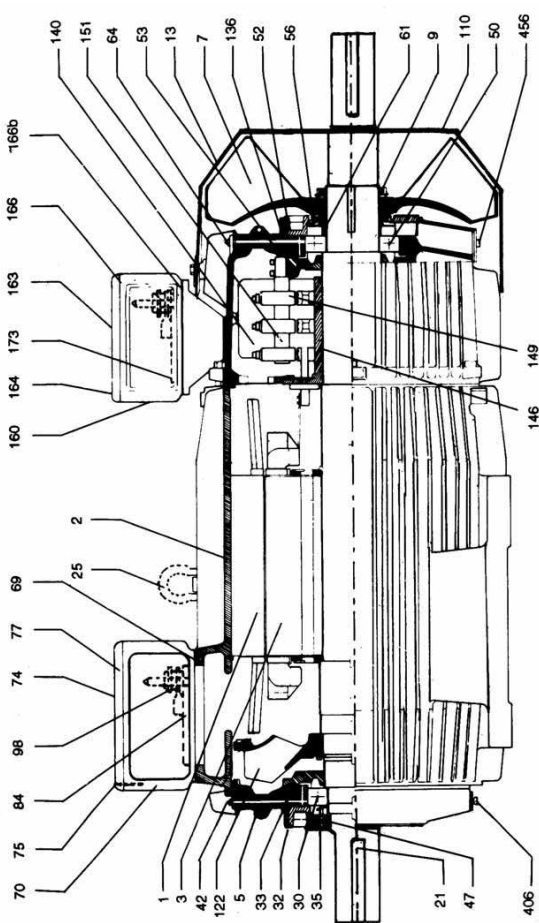
- Mount the DE bearing (30) on the rotor shaft (take care not to forget the inner bearing retainer (33)), and also the NDE bearing (50) and the inner bearing retainer (53).
- Insert the rotor in the stator taking care not to knock the winding.
- Present the shields, grease nipples facing upwards.
- Begin with the DE shield (30). Fix a dowel pin in one of the inner bearing retainer (33) tapped holes **so that the grease inlet pipes fully correspond**.
- Slide it into position.

- End with the NDE shield (50). Fix a dowel pin in one of the inner bearing retainer (53) tapped holes **so that the grease inlet pipes fully correspond**.
- Slide it into position.
- Lift the rotor slightly and fit the shields onto the housing.

From now on we recommend checking, at every step, that the rotor turns freely by hand before continuing to the next instruction.

- Replace the shield fixing screws.
- Replace the outer bearing retainer (32) on the DE shield (30).
- Replace the labyrinth seal (47).
- Reconnect the wires on the brush holders and replace the inspection doors.
- Replace the outer bearing retainer (52) on the NDE shield (50) with its SKF nut (9).
- Replace the fan (7).
- Lubricate the DE and NDE antifriction bearings in accordance with the information on the nameplate.

FLSB-FLSLB 280 to 355

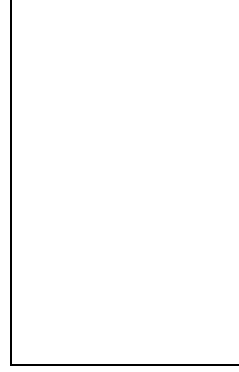


FLSB-FLSLB 280 to 355

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	50	Non drive end bearing	136	Slip-ring housing
2	Housing	52	Outer NDE bearing retainer	140	Inspection door
3	Wound rotor	53	Inner NDE bearing retainer	146	Commutator
5	DE shield	56	Moving part of NDE grease valve	149	Brush holder
7	Fan	61	NDE spacer ring	151	Brush holder rod
9	Nut	64	NDE grease nipple	160	Rotor terminal box
13	Fan cover	69	Stator terminal box seal	163	Rotor terminal box lid
21	Shaft extension key	70	Stator terminal box	164	Rotor terminal box screws
25	Lifting ring	74	Stator terminal box lid	166	Rotor terminal box lid seal
30	Drive end bearing	75	Stator terminal box screws	166b	Rotor terminal box seal
32	Outer DE bearing retainer	77	Stator terminal box lid seal	173	Rotor terminal box baseplate
33	Inner DE bearing retainer	84	Terminal block with terminals	406	DE grease valve cover plate
35	Moving part of DE grease valve	98	Stator connector links	456	NDE grease valve cover plate
42	DE grease nipple	110	Louvers		
47	Bearing labyrinth seal (drive end)	122	Stirrer		

LERØY-SOMER	INSTALLATION AND MAINTENANCE	3770 en - 06.2007/ c
3-phase TEFV induction motors (slip-ring or cage type) NOTES		

LERØY-SOMER	INSTALLATION AND MAINTENANCE	3770 en - 06.2007/ c
3-phase TEFV induction motors (slip-ring or cage type) NOTES		



7.3 ELECTRIC MOTORS (SIEMENS)

Function / Location	ECL Code	Motor ref.	Power	Brake Ref.	Recommended Braking Torque N.m
(x1) Hydraulic unit sub ass'y	1-10-894-19	180 L – 1 LG6	22 kW	–	–



Drehstrommotoren

Three-Phase Motors
Moteurs triphasés
Motores trifásicos
Motori trifasi
Trefasmotorer

1LA5 1LB5 1LC5 1LP5 1PP5 1LA9 1LP9 1PP9
1MA5 1MF5

BG 225 S, M ≡ BG 200 L

Betriebsanleitung/Instructions

Ausgabe / Edition: 1.94

Bestell-Nr./Order No.: 610.42348.21.a
DEUTSCH / ENGLISH / FRANÇAIS / ESPAÑOL / ITALIANO / SVENSKA

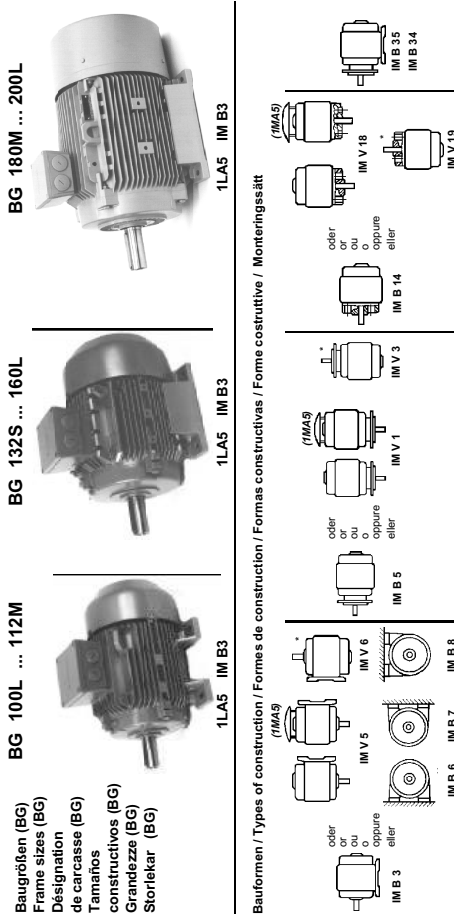


Fig. 1

* s. "4 EEx e Motoren" / see "4 EEx e motors" / voir "4 Moteurs EEx e" / voir "4 Motori EEx e" / se "EEx e-Motoren"

General note

WARNING The data and recommendations specified in all the instructions supplied, and in all other related instructions, must always be observed in order to avoid hazardous situations and the risk of possible injury or damage.

These instructions are augmented by supplementary instructions (yellow), which contain additional information on the safety measures for electrical machines and devices. The latter instructions thus augment all submitted instructions and all other related instructions. Furthermore, the pertinent national, local and plant-specific regulations and requirements should be kept in mind!

Special designs and other versions may vary in technical details! If in doubt, be sure to contact the manufacturer, quoting the type designation and serial number, or have maintenance work done by one of SIEMENS Service Centres.

NOTE: Fig. 2 ... (Spare Parts) see Annex page 16

1 Description

1.1 Application

The motors are suitable for operation in dusty and damp environments. The insulation is tropicalized. If they are properly stored or installed outdoors, special weatherproofing measures are not usually required.

Measuring-surface sound-pressure level at 50 Hz

(DIN EN 21 680 Part 1)

1LA5, 1MA5

approx. 51 to 76 dB(A)

1.2 Construction and mode of operation

1LA5, 1LA9, 1LB5, 1LC5 and 1MA5 motors are self-ventilated (with fans). 1PP5 and 1PP9 motors are self-ventilated either by separate fans arranged on the rotors, such as for service as fan motors, or by external fans. 1LP5, 1LP9 and 1MF5 motors are non-ventilated (without fans).

The feet on foot-mounted motors with frame sizes 100L and 112M are cast integrally with the frame. The feet on motors with frame sizes 132S to 200L are bolted onto the frame (see Fig. 2).

For this reason, rearranging the feet (such as for changing the position of the terminal box - see Fig. 5) is only possible on frame sizes 132S to 200L. With frame sizes 180M...200L, threads will also have to be cut in the existing drilled holes in the frame to receive the foot mounting screws. In such cases, however, the support faces of the feet may have to be remachined or provided with shims to ensure that the motor is level. Where 1LC5 motors are concerned, please also observe the brake operating instructions.

2 Operation

WARNING Before starting any work on the machine, be sure to isolate it from the power supply.

2.1 Transport, storage

The motors should always be lifted at both lifting eyes during transport.

WARNING For lifting machine sets (such as built-on gearboxes, fan units), always use the lifting eyes or lifting lugs provided! Machine sets may not be lifted by suspending the individual machines! Check the lifting capacity of the hoist!

If, after delivery, the motors are stored for more than 4 years under favourable conditions (kept in a dry place free from dust and vibration) prior to commissioning, the bearings should be regreased.

Under unfavourable conditions, this period is considerably shorter. If necessary, the insulation resistance of the winding should be checked, see Section 2.5.

2.2 Installation

After installation, screwed-in lifting eyes should either be removed or tightened down.

In the case of motors with shaft end facing upwards or downwards (such as IMV5, IMV6 - see Fig. 1), measures must be taken to ensure that no water can penetrate into the upper bearing.

In the case of terminal boards with 6 terminals, the top part of the terminal box can be turned through 4 x 90 degrees. For terminal boards with 9 terminals, it can be turned through 180 degrees.

Quiet running

Stable foundations or mounting conditions, exact alignment of the motors and a well-balanced transmission element are essential for quiet vibration-free running. If necessary, shims should be inserted under the motor feet to prevent strain, or the whole rotor and transmission element should be balanced.

2.3 Balancing, transmission elements

A suitable device should always be used for fitting and removing the transmission elements (coupling halves, pulleys, pinions) (Fig. 7).

As standard, the rotors are dynamically balanced with the complete featherkey inserted.

From 1991 onwards, the type of balance has been marked on the drive end of the shaft (shaft end face):

(F = balanced with full featherkey)

(H = balanced with half featherkey)

When fitting the transmission element, keep the type of balance in mind!

Balance with half featherkey

Poor running characteristics can arise in the case of transmission elements having a hub length ratio of hub length l to length of shaft end $l_s < 0.8$ and running at speeds $n > 1500$ rev/min (see Fig. 8). If necessary, re-balancing should be carried out, e.g. the part of the featherkey 1_s that protrudes from the transmission element and above the shaft surface should be cut back.

The usual measures should be taken to guard transmission elements from touch. If a motor is started up without transmission element attached, the featherkey should be secured to prevent it being thrown out.

2.4 Electrical connection

Check to see that system voltage and frequency agree with the data given on the rating plate. Voltage or frequency deviations of $\pm 5\%$ (for 1MA5/1MF5, frequency deviations of $\pm 3\%$) from the rated values are permitted without the necessity of derating the output. Connection and arrangement of the terminal links must agree with the diagram provided in the terminal box. Connect the earthing conductor to the terminal with the \oplus marking.

Wherever terminal clips are used (for example, to DIN 46282), arrange the conductors so the clips are virtually level, i.e. not tilted when tightened. This method of connection means that the ends of single conductors must be bent in the shape of a U or be fitted with a cable lug (see Fig. 3.1). This also applies to the green-yellow protective earthing conductor and the outer earthing conductor (see Fig. 3.2).

Please refer to Fig. 4 for tightening torques for terminal bolts and nuts (except for terminal strips).

2.5 Checking the insulation resistance

The insulation resistance of the windings must be measured prior to initial startup of the machine, after long periods of storage or standstill (approx. 6 months).

WARNING While the measurement is being taken and immediately afterwards, some of the terminals carry dangerous voltages and must not be touched.

Insulation resistance

- The minimum insulation resistance of new, cleaned or repaired windings with respect to ground is 10 MOhm.
- The critical insulation resistance R_{crit} is calculated first by multiplying the rated voltage U_N , e.g. 0.69 kV AC, with the constant factor (0.5 MOhm/kV): $R_{crit} = 0.69 \text{ kV} \cdot 0.5 \text{ MOhm/kV} = 0.345 \text{ MOhm}$.

Measurement

The **minimum insulation resistance** of the windings to ground is measured with 500 V DC. The winding temperature should then be 25°C ± 15 °C.

The **critical insulation resistance** should be measured with 500 V DC with the winding at operating temperature.

Checking

If the **minimum insulation resistance** of a new, cleaned or repaired machine, which has been stored or at standstill for a prolonged period of time, is less than 10 MOhm, this may be due to humidity. The windings must then be dried.

After long periods of operation, the **minimum insulation resistance** may drop to the **critical insulation resistance**. As long as the measured value does not fall below the calculated value of the **critical insulation resistance**, the machine may continue in operation. If it does, the machine must be stopped immediately.

The cause must be determined, and the windings or winding sections repaired, cleaned or dried as necessary.


2.6 Commissioning

NOTE: Where the torque is very uneven (the drive of a piston-type compressor, for example), the inevitable result is a non-sinusoidal motor current, whose harmonics can lead to excessive system perturbation or excessive electromagnetic interference.

In the case of converter-fed motors, high-frequency current or voltage harmonics in the motor cables can give rise to electromagnetic interference. That is why the use of shielded cables is recommended.

Before commissioning, check that:


- The minimum insulation resistances are adhered to
 - The rotor turns freely without rubbing
 - The motor is properly assembled and aligned
 - The transmission elements are correctly adjusted (e.g. belt tension) and the transmission element is suitable for the given operating conditions
 - All electrical connections, mounting screws and connecting elements are properly tightened and fitted
 - All protective conductors are properly installed
 - Any auxiliaries that may be fitted (brakes) are in working order
 - Touch protection guards are installed around moving and live parts
 - The maximum speed n_{max} (see rating plate) is not exceeded.
- NOTE:** The maximum speed n_{max} is the highest operating speed permitted for short periods. It should be kept in mind that motor noise and vibration are worse at this speed, and bearing life is reduced.

 **CAUTION** After motor installation, the brake, if fitted, should be checked for proper functioning.

It is not possible to formulate a complete check list. Other checks may also be necessary!

3 Maintenance

Safety precautions

 **WARNING** Before starting any work on the motor or other equipment, particularly before opening covers over live or moving parts, the motor must be properly isolated from the power supply. Besides the main circuits, any additional or auxiliary circuits that may be present must also be isolated.

The usual "5 safety rules" (as set forth in DIN VDE 0105) are:

- Isolate the equipment
- Take effective measures to prevent reconnection
- Verify equipment is dead
- Earth and short-circuit
- Cover or fence off adjacent live parts

The precautions listed above should remain in force until all maintenance work is finished and the motor has been fully assembled.

4 **EEx e motors 1MA5, 1MF5**
DIN EN 50014/VDE 0170/0171 Part 1 and
DIN EN 50019/VDE 0170/0171 Part 6



The special information in *italics* applies to these motor versions!

*1MA5 motors mounted with the shaft extension pointing upwards, e.g. types of construction IM V 3, IM V 6, IM V 19 (see Fig. 1), must be fitted with a cover to prevent foreign particles from dropping into the fan cowl of the motor (see DIN EN 50014/VDE 0170/0171 Part I, Section III, 16.1). This cover must not impair effective motor ventilation by the shaft-mounted fan.

The temperature class of the motor indicated on the rating plate must correspond to the temperature class of any combustible gas that is likely to occur. Each motor must be provided with a circuit-breaker which is set to the rated current of that motor and which, under locked-rotor conditions, trips within the t_c time stated on the motor rating plate (compare with the tripping characteristic supplied with the circuit-breaker). In the case of delta-connected motors, overload protection (including phase-failure protection) should be provided. Pole-changing motors require a separate circuit-breaker for each speed.

If, however, overload protection is to be provided only in the form of direct temperature monitoring based on temperature sensors (see DIN EN 50019/VDE 0170/0171 Part 6, Appendix A-A1.b), the motor design must be specially tested and certified for this.

See **DIN 57165/VDE 0165**.

Repairs must be carried out in Siemens workshops or inspected by an officially approved specialist.

NOTE: Where motors are fitted with closed condense water openings (e.g. degree of protection IP55 or IP56; see rating plate), these should be opened from time to time to allow any accumulated condense water to drain away.

Condense water openings should always be at the lowest point of the motor!

Fitting new bearings, type of grease

Under normal operating conditions, with horizontally mounted motors and coolant temperatures of up to 40 °C, the bearings should be changed at intervals of:

- approx. 20,000 operating hours for speeds of 1500 rev/min
 - approx. 10,000 operating hours for speeds of 3000 rev/min
- In respect of the number of operating hours, the grease should be renewed every 3 years because of ageing.

In the case of motors operating under special conditions, such as vertical motor position, frequent operation at maximum speed n_{max} , heavy vibration, sudden load changes and frequent reversing operation, the bearing should be changed at considerably more frequent intervals than at the operating hours stated above.

The motors feature deep-groove ball bearings which are provided with a cover plate (ZC3 version).

The cover plate is arranged on that side of the bearing facing the frame (stator).

NOTE: Notice the cover plate arrangement when changing the bearings, because it can vary between standard and special motors!

The cover plate material should withstand temperatures from -20 °C to +150 °C, e.g. polyacryl-rubber (ACM).

Type of grease for standard machines: UNIREX N3 (Esso); synthetic greases must conform to DIN 51825-K3N.

Special greases should be indicated on the rating plate.

Avoid mixing different types of grease!

Dismantle the motor to the extent necessary. Pull off the bearing with a suitable device (see Fig. 6). Clean the journal! Clean the bearing or obtain a new one, and pack it with fresh grease.

Pack the bearing cavities flush with grease! The cover plate or endshield is kept free of grease to prevent overgreasing.

Heat bearings evenly to about 80-100 °C and press on. Heavy blows (such as with a hammer, ...) should be avoided.

Any worn sealing elements (such as shaft sealing ring, etc.) should also be renewed.

If springless radial shaft sealing rings are used, the replacement sealing rings must also be of the springless type.

Regreasing device

In the case of motors with regreasing device, take note of the information given on the rating plate!

Joint sealing

When reassembling machines with degree of protection IP55 or higher (see rating plate), the bright surfaces of the joint between the motor frame and the endshields should be coated with a suitable non-hardening sealing compound, such as Fluid-D.

Plastic fan (frame sizes 180M ... 200L)

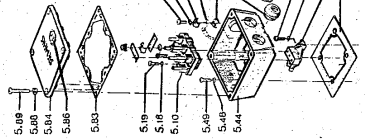
Plastic fans have two cast-on tabs that snap into the ring groove on the shaft to prevent axial movement. Before the fan is pulled off the shaft, these two tabs must be disengaged and held temporarily in that position, e.g. by inserting packing. In the disc at the root of the blades, there are two openings for the claws of an extractor whose central screw should press against the hub. On delivery, these openings may be covered by a film of plastic.

A suitable device should be used for pulling the fan off and pressing it back on. Hammer blows must be avoided.

BG 100L ... 160L

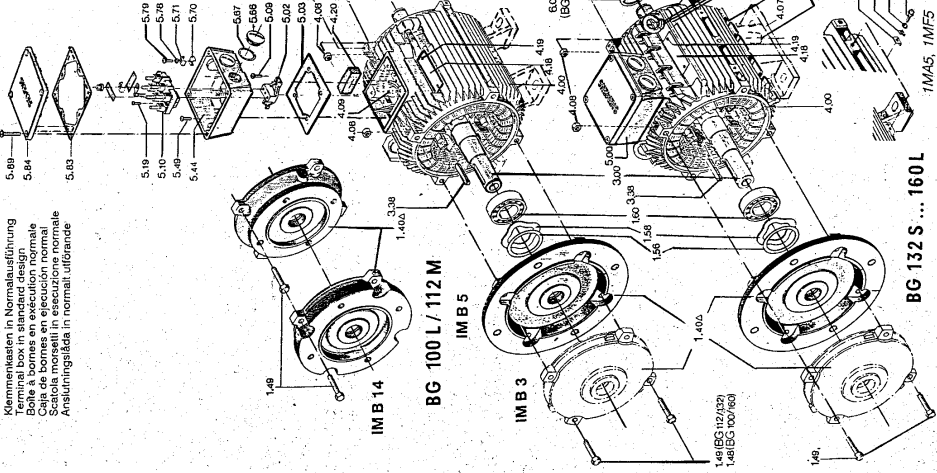
1MA5 1MF5

Klemmenkasten in EEx-e-Ausführung
Terminal box in EEx-e design
Caja de bornes en ejecución EEx-e
Cassa di bornes in esecuzione EEx-e
Anslutningskåda i explosionsskyddad
utvärning EEx-e



1LA5 1LB5 1LP5 1PP5
1LA9 1LP9 1PP9

Klemmenkasten in Normalausführung
Terminal box in standard design
Boîte à bornes en exécution normale
Scatola morsetti in esecuzione normale
Anslutningskåda in normal utförande



Bei Aluminium-Lagerschildern ist in die Nabe entweder ein Federband (1.61/6.11) eingeleitet (Slide im Federband einleiten) oder ein Stahling eingegossen.
With aluminium end shields, either a spring band (1.61/6.11) is inserted (band hooked in) or a steel ring is cast in the hub.
Les flasques-paliers en aluminium comportent soit une lame élastique (1.61/6.11) introduite de telle manière qu'elle se boisse dans la gorge, soit un anneau en acier inséré par coulé.
En el cubo del escudo portacojinetes de aluminio puede haber una banda elástica (1.61/6.11) cuyos abultamientos se enganchan en el canal, o hay embebido un anillo de acero.
Nel mozzo degli scudi in alluminio è stato inserito o un anello in acciaio fuso, o un nastro flessibile (1.61/6.11). Il cui rilievo è innestato nelle gole.
I Lagerkörper av aluminium är antingen inlagit i revet (vulsten inpassad i underskärningen) eller ingjutet i en ställing.

Fig. 2 +

ANHANG / APPENDIX / ANEXO / APPENDICE / BILAGA

DEUTSCH

ENGLISH

Ersatzteile, von Werk lieferbar
(s. Bestellbeispiel)
1.00 Lagerung AS
40 Lagerschild
43 Anello torico
58 Federelastische
59 Federelastische
60 Wälzlager
61 Federband für Lagerschildnabe
(nicht immer vorhanden)

3.00 Lüfter, komplett
88 Fan for fan
4.00 Stator, komplett
12 Flange nut (frame size 132/160)
14 Mutter
18 Raftering ring
19 Schraube
20 Federelastische
21 Federelastische
22 Federelastische
23 Federelastische
24 Federelastische
25 Federelastische
26 Federelastische
27 Federelastische
28 Federelastische
29 Federelastische
30 Federelastische
31 Erdungswinkel

5.00 Klemmenkasten, komplett
02 Gehäuse (entfällt bei BG 180...200)
03 Dichtung
10 Klemmenbrett, komplett
44 Klemmenkasten-Oberteil
53 Verschlußstopfen
70 Klemmbügel
71 Klemmbügel
72 Klemmbügel
73 Klemmbügel
74 Klemmbügel
75 Klemmbügel
76 Klemmbügel
77 Klemmbügel
78 Klemmbügel
79 Klemmbügel
80 Klemmbügel
81 Klemmbügel
82 Klemmbügel
83 Klemmbügel
84 Klemmbügel
85 Klemmbügel
86 Klemmbügel
87 Klemmbügel
88 Klemmbügel
89 Klemmbügel

6.00 Lagerung BS
10 Wälzlager
11 Federband für Lagerschildnabe
(nicht immer vorhanden)
20 Wälzlager
21 Wälzlager
22 Wälzlager
23 Wälzlager
24 Wälzlager
25 Wälzlager
26 Wälzlager
27 Wälzlager
28 Wälzlager
29 Wälzlager
30 Wälzlager
31 Wälzlager

7.00 Belüftung, komplett
04 Lüfter
40 Lüfter
41 Winkel
Auf- und Abziehvorrichtungen für Wälzlager, Lüfter und Abtriebsantriebe sind nicht lieferbar!

ITALIANO
Parti di ricambio, fornibili dalla fabbrica (vedi esempio)
1.00 Scudo lato comando
40 Scudo di supporto
43 Anello torico
58 Rondella elastica
59 Rondella elastica
60 Cuscinetto a rullamento
61 Nastro elastico per mozzo dello scudo di supporto (non sempre inserito)
3.00 Rotore, completo
88 Chavetta per ventilatore
4.00 Statore, completo
12 Piedino della carcassa
14 Dado
18 Taglietta
19 Vite
20 Copricapo
21 Copricapo
22 Copricapo
23 Angolare di messa a terra

5.00 Scatola morsetti, completa
02 Piazzo intermedio (non presente nei BG 180...200)
03 Guarnizione a corda
10 Morsettiliera completa
44 Parte superiore della scatola morsetti
53 Coperchio completo
70 Morsetto di serraggio
71 Morsetto di serraggio
72 Morsetto di serraggio
73 Morsetto di serraggio
74 Morsetto di serraggio
75 Morsetto di serraggio
76 Morsetto di serraggio
77 Morsetto di serraggio
78 Morsetto di serraggio
79 Morsetto di serraggio
80 Morsetto di serraggio
81 Morsetto di serraggio
82 Morsetto di serraggio
83 Morsetto di serraggio
84 Morsetto di serraggio
85 Morsetto di serraggio
86 Morsetto di serraggio
87 Morsetto di serraggio
88 Morsetto di serraggio
89 Morsetto di serraggio

6.00 Supporto opposto al lato comando
10 Cuscinetto a rullamento
11 Piedino della carcassa
14 Dado
18 Taglietta
19 Vite
20 Copricapo
21 Copricapo
22 Copricapo
23 Angolare di messa a terra
7.00 Ventilatore, completo
04 Flisker
40 Flisker
41 Winkel
Pia- och avdragsare för rullningslager, fläkt och drivdon kan ej erhållas.

FRANÇAIS

Pièces de rechange, livrables par l'usine (voir exemple de commande)
1.00 Palier côté entraînement
40 Flaque-palier
43 Anneau torique
58 Rondelle de compensation
59 Rondelle de compensation
60 Roulement
61 Bande élastique pour moyeu du flaque-palier (pas toujours présente)
3.00 Rotor, complet
88 Clavette pour ventilateur
4.00 Stator, complet
12 Ecrou de bride (HA 132...200)
14 Nut
18 Plaque signalétique
19 Vis
20 Rondelle élastique
21 Rondelle élastique
22 Rondelle élastique
23 Rondelle élastique
24 Rondelle élastique
25 Rondelle élastique
26 Rondelle élastique
27 Rondelle élastique
28 Rondelle élastique
29 Rondelle élastique
30 Rondelle élastique
31 Angle de mise à la terre

5.00 Boîte à bornes, complète
02 Pièce intermédiaire (non livrée sur BG 180...200)
03 Joint (torqueur sur HA 180...200)
10 Plaque à bornes, complète
44 Partie supérieure de la boîte à bornes
53 Bouchon
70 Etrier de serrage
71 Etrier de serrage
72 Etrier de serrage
73 Etrier de serrage
74 Etrier de serrage
75 Etrier de serrage
76 Etrier de serrage
77 Etrier de serrage
78 Etrier de serrage
79 Etrier de serrage
80 Etrier de serrage
81 Etrier de serrage
82 Etrier de serrage
83 Etrier de serrage
84 Etrier de serrage
85 Etrier de serrage
86 Etrier de serrage
87 Etrier de serrage
88 Etrier de serrage
89 Etrier de serrage

6.00 Palier côté opposé à l'entraînement
10 Roulement
11 Bande élastique pour moyeu du flaque-palier (pas toujours présente)
20 Flaque-palier
21 Flaque-palier
22 Flaque-palier
23 Flaque-palier
24 Flaque-palier
25 Flaque-palier
26 Flaque-palier
27 Flaque-palier
28 Flaque-palier
29 Flaque-palier
30 Flaque-palier
31 Flaque-palier

7.00 Ventilateur, complète
04 Ventilateur
40 Capot du ventilateur
41 Angulaire
Les dispositifs d'emmanchement et d'extrusion pour roulements, ventilateurs et organes de transmission ne sont pas livrables.

SVENSKA
Reservdelar, tillgängliga från fabriken (se beställningsexempel)
1.00 Lager för axelstopp
40 Lagerschild
43 Anello torico
58 Federelastisk
59 Federelastisk
60 Wälzlager
61 Federband för lagerschildnäv (ej alltid)
3.00 Rotor, komplett
88 Kl för fläkt
4.00 Stator, komplett
12 Flänsmutter (BG 132/160)
14 Mutter
18 Märkplåt
19 Skruv
20 Sköld
21 Sköld
22 Sköld
23 Sköld
24 Sköld
25 Sköld
26 Sköld
27 Sköld
28 Sköld
29 Sköld
30 Sköld
31 Jordningsvinkel
På- och avdragsare för rullningslager, fläkt och drivdon kan ej erhållas.

5.00 Uttagsskåda, komplett
02 Mellanskytke
10 Rätting
44 Avslutningsgälda, övertill
45 Leding, komplett
53 Avslutningsgälda
70 Klanskytke
71 Klanskytke
72 Klanskytke
73 Klanskytke
74 Klanskytke
75 Klanskytke
76 Klanskytke
77 Klanskytke
78 Klanskytke
79 Klanskytke
80 Klanskytke
81 Klanskytke
82 Klanskytke
83 Klanskytke
84 Klanskytke
85 Klanskytke
86 Klanskytke
87 Klanskytke
88 Klanskytke
89 Klanskytke

6.00 Lager för fläkskådan (B-sidan)
10 Rullningslager
11 Fläkskådan för lagerskådsnav (fins ej alltid)
20 Lagerskådan
23 Avslutning
7.00 Fläksvning, komplett
04 Fläsk
40 Fläsk
41 Vinkel
På- och avdragsare för rullningslager, fläkt och drivdon kan ej erhållas.

** Teile entfallen bei 1LP5, 1LP9, 1PP5, 1PP9, 1MF5. Bei 1LC5 s. zugehörige Bremsenbetriebsanleitung.
1LP5, 1LP9, 1PP5, 1PP9, 1MF5 motors don't have these parts. For 1LC5 motors refer to the relevant brake operating instructions.
Certains pièces sont supprimées pour les types 1LP5, 1LP9, 1PP5, 1PP9, 1MF5. Pour le type 1LC5, voir instructions de service des freins correspondantes.
Piezas suprimidas en 1LP5, 1LP9, 1PP5, 1PP9, 1MF5. Para 1LC5 véase las instrucciones de servicio correspondientes al freno.
Queste parti sono mancanti nei motori di grandezza 1LP5, 1LP9, 1PP5, 1PP9, 1MF5. Per il motore 1LC5, anche le istruzioni del freno attinenti.
Förkommer ej i 1LP5, 1LP9, 1PP5, 1PP9, 1MF5. Vid 1LC5, se tillhörande driftinstruktion för bromsen.

**Lagerwechsel / Changing bearings / Remplacement des roulements
Cambio de cojinetes / Sostituzione del cuscinetto / Lagerbyte**

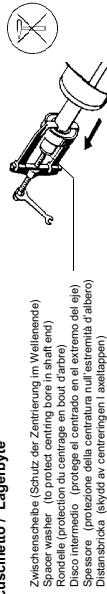
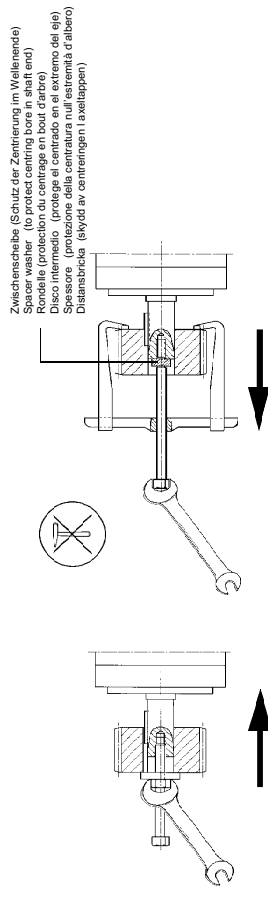


Fig. 6

**Auf- und Abziehen von Abtriebsselementen / Pressing on and pulling off drive elements
Emmanchement et extraction d'organes de transmission / Calado y extracción de elementos
Calettamento ed estrazione degli elementi di azionamento / På- och avdragning av driv**



Zum Aufziehen von Abtriebs- (Kupplung, Zahnräder, Riemenscheiben usw.), Gewinde im Wellenelement und - sofern möglich - Abtriebsselemente nach Bedarf erwärmen. Zum Anziehen geeignete Vorrichtung verwenden. Es dürfen beim Auf- und Abziehen keine Schläge (z.B. mit Hammer oder ähnlichem) oder größere als die laut Katalog zulässigen radialen oder axialen Kräfte über das Wellenelement auf die Motorflanke übertragen werden.

Use the tapped hole provided in the end of the shaft for fitting drive components such as couplings, gearwheels, belt pulleys, etc. and, if possible, heat the components as necessary. Use a suitable puller tool for removing the components. Do not strike the components, e.g. with a hammer or similar tool, when fitting or removing them and do not exert more than the maximum value of radial or axial force - according to the catalog - transmitted to the motor bearings through the shaft extension.

Pour monter les organes de transmission (accouplements, roues dentées, poulies à courroie, etc.), utiliser le taraudage du bout d'arbre. Au besoin et lorsque cela est possible, chauffer les organes de transmission. Pour le montage, utiliser un dispositif approprié. Aucun coup (par ex. marteau) supérieur aux efforts axiaux et radiaux admissibles mentionnés au catalogue ne doit être transmis par l'arbre aux roulements en cours de montage ou de démontage.

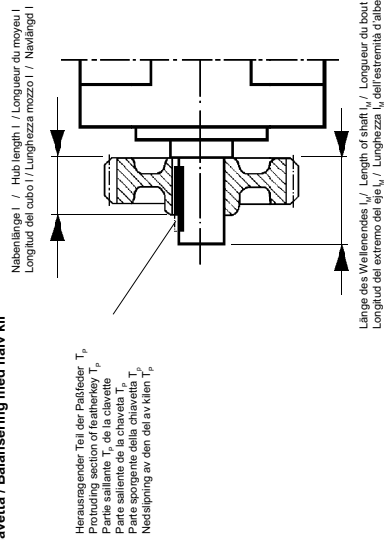
Para calar los elementos de acoplamiento, rueda dentada, polea, etc.) utilizar la rosca en el extremo del eje y siempre que sea posible - calentar convenientemente dichos elementos. Utilizar el dispositivo adecuado para la extracción. Durante las operaciones de calado o extracción no golpear (p. ej. con martillo o similar) ni ejercer sobre los cojinetes del motor a través del extremo del eje fuerzas axiales o radiales superiores a las admisibles según catálogo.

Per cacciare gli elementi di azionamento (giunti, ruote dentate, pulegge, ecc.), utilizzare il foro filettato nell'estremità d'albero e, se possibile, riscaldare gli elementi di azionamento. Per estrarre i giunti, utilizzare il cuneo di estrazione fornito con il catalogo. Per estrarre le pulegge, utilizzare il cuneo di estrazione fornito con il catalogo. Per estrarre le ruote dentate, utilizzare il cuneo di estrazione fornito con il catalogo. Per estrarre i cuscinetti, utilizzare il cuneo di estrazione fornito con il catalogo. Per estrarre i cuscinetti, utilizzare il cuneo di estrazione fornito con il catalogo. Per estrarre i cuscinetti, utilizzare il cuneo di estrazione fornito con il catalogo.

Använd utställarens gånga vid pådragnen av dividen (koppling, kugghjul, remskiva etc) och värn om möjligt upp dividen om så behövs. Använd lämpliga verktyg för avdragnen. Några slag (t.ex. med hammare o.d.y.) får aldrig förekomma vid på- och avdragnen, och axiella krafter som är större än de som anges i katalogen får inte överföras till motorlagren via axellagren.

Fig. 7


Auswuchtung mit halber Pfafeder / Balancing with half featherkey
Equilibrage avec demi-clavette / Equilibrado con media chaveta
Equilibratura con mezza chiavetta / Balansering med halv kil



Longitud del extremo del eje l_m / Lunghezza l_m dell'estremità d'albero / Axeltappens längd l_m

Fig. 8

Änderungen vorbehalten/ Subject to change without prior notice/ Sous réserve de modifications/ Sujeto a modificaciones/ Con riserva di eventuali modifiche/ Förbehåll för ändringar

Geschäftsgebiet Geschäftszweig	Antriebstechnik / Drives Systems Division Niederspannungsmotoren / Subdivision Low-Voltage Motors D-97615 Bad Neustadt an der Saale	 Antriebs-, Schalt- und Installationstechnik von Siemens
Siemens Aktiengesellschaft		
Bestell-Nr. / Order No.: 610.42348.21.a Printed in the Federal Republic of Germany AG 01 94 MA 20 De-En-Fr-Sp-It-Sv		

7.4 BRAKE MOTORS FCR

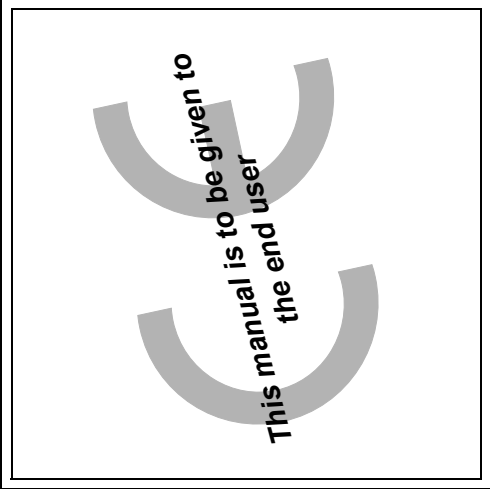
Function / Location	ECL Code	Motor ref.	Power	Brake Ref.	Recommended Braking Torque N.m
(x1) Turret rotation mechanism	1-10-065-83	LSMV 132 M	7,5 kW	FCR	80 Nm





6

en





(F)LS - (F)LSIA - LSMV - (F)LSPX - FCR

3-phase asynchronous brake motors

Installation and maintenance

IMPORTANT

These symbols   appear in this document whenever it is important to take special precautions during installation, operation, servicing or maintenance of the motors.

It is essential that electric motors are installed by experienced, qualified and authorised personnel.

In accordance with the main requirements of EEC Directives, the safety of people, animals and goods should be ensured when fitting the motors into machines.



Particular attention should be given to the equipotential ground or earthing connections.

The noise level of the machines, measured under normal conditions, conforms to the requirements of the standard and does not exceed the maximum value of 85 dB(A) pressure at 1 metre.

**The following precautions must be taken before working on any stopped device:**

- mains voltage disconnected and no residual voltage present
- careful study of the causes of the stoppage (blocked transmission - loss of phase - cut-out due to thermal protection - lack of lubrication, etc)

1 - PREFACE: TRAINING

Electric motors are industrial products. Therefore, they must only be installed by qualified experienced and authorised personnel. The safety of people, animals and goods should be ensured when fitting the motors into machines.
(Please refer to current standards)

Those persons required to work on electrical installations and equipment in zones where there is a risk of explosion must be specially trained in the necessary skills. In effect, they must be familiar not only with the electrical risks, but also with those that are due to the chemical properties and physical characteristics of products used in the installation (gas, vapour, dust), as well as the environment in which the equipment operates. These elements dictate the risk of fire and explosion.

In particular, they must be informed and aware of the specific safety reasons and requirements in order to adhere to them. For example:

- do not open when powered up,
- do not open when powered up in atmospheres containing explosive dust,
- do not separate when powered up,
- do not manoeuvre when on load,
- wait several minutes before opening,
- replace the seals tightly to ensure watertightness.

Caution
The specifications, instructions and descriptions are for standard operation. They do not take account of structural variants or special adaptations. Failure to comply with these recommendations may lead to premature deterioration of the motor and voiding of the manufacturer's guarantee.

Dear customer,

You have just acquired a LEROY-SOMER motor.

This motor benefits from the experience of one of the largest manufacturers in the world, using state-of-the-art technology in automation, specially selected materials, rigorous quality control. As a result, the regulatory authorities have awarded our motor factories the ISO 9001-Edition 2000 international certificate.

We thank you for making this choice, and would ask you to read the contents of this manual.

By observing a few essential rules, you will ensure problem-free operation for many years.

LEROY-SOMER

CE CONFORMITY:
The motors carry the **CE** mark and therefore conform with the Low Voltage Directive 73/23/EEC modified by Directive 93/68, as well as Directive ATEX 94/9/EC.

MOTEURS LEROY-SOMER

DECLARATION OF CONFORMITY AND INCORPORATION

LEROY-SOMER MOTORS declare that the components :
conform to the harmonized standard EN 60 034 (IEC 84) affixed after the essential requirements of the Low Voltage Directive 73-23 EEC of 19th January 1973 modified by Directive 93/68 EEC of 22nd July 1993.

The components thus defined also meet the essential requirements of the Electromagnetic Compatibility Directive 89-336 EEC of 3rd May 1989 modified by Directive 92-31 EEC of 28th April 1992 and 93-68 EEC of 22nd July 1993 if they are used within certain voltage limits (see table).

The components of this assembly (these components are not the subject of this declaration) incorporated and/or assembled conform to at least the requirements in standard EN 60204 Electrical Equipment for Machinery and our installation manual.

The components defined above must not be installed inside the machine in which they are used. The components must be installed in accordance with the instructions in the manual. The components must be installed in accordance with the instructions in the manual and/or the instructions of the manufacturer of the machine in which they are used.

Declaration made by
Quality Director
MOTEURS LEROY-SOMER

At
On
Signature

MOTEURS LEROY-SOMER

EG DECLARATION OF CONFORMITY AND INCORPORATION

MOTEURS LEROY-SOMER, Paris de RABON, France
We hereby declare, under our sole responsibility that the products:
Asynchronous Motors of series LS FCR, FLS FCR with or without speed controller ARMECA
Motor (FLS FCR

CE markings on plates
IEC 1010 IP 55 To max 120°C (for Zone 22 Non-Conductors) 400V

conform to the following standards:
• International standards:
EN 60034-1-1-2
EN 60034-2-1
EN 60034-3-1
EN 60034-3-2
EN 60034-3-3
EN 60034-3-4
EN 60034-3-5
EN 60034-3-6
EN 60034-3-7
EN 60034-3-8
EN 60034-3-9
EN 60034-3-10
EN 60034-3-11
EN 60034-3-12
EN 60034-3-13
EN 60034-3-14
EN 60034-3-15
EN 60034-3-16
EN 60034-3-17
EN 60034-3-18
EN 60034-3-19
EN 60034-3-20
EN 60034-3-21
EN 60034-3-22
EN 60034-3-23
EN 60034-3-24
EN 60034-3-25
EN 60034-3-26
EN 60034-3-27
EN 60034-3-28
EN 60034-3-29
EN 60034-3-30
EN 60034-3-31
EN 60034-3-32
EN 60034-3-33
EN 60034-3-34
EN 60034-3-35
EN 60034-3-36
EN 60034-3-37
EN 60034-3-38
EN 60034-3-39
EN 60034-3-40
EN 60034-3-41
EN 60034-3-42
EN 60034-3-43
EN 60034-3-44
EN 60034-3-45
EN 60034-3-46
EN 60034-3-47
EN 60034-3-48
EN 60034-3-49
EN 60034-3-50
EN 60034-3-51
EN 60034-3-52
EN 60034-3-53
EN 60034-3-54
EN 60034-3-55
EN 60034-3-56
EN 60034-3-57
EN 60034-3-58
EN 60034-3-59
EN 60034-3-60
EN 60034-3-61
EN 60034-3-62
EN 60034-3-63
EN 60034-3-64
EN 60034-3-65
EN 60034-3-66
EN 60034-3-67
EN 60034-3-68
EN 60034-3-69
EN 60034-3-70
EN 60034-3-71
EN 60034-3-72
EN 60034-3-73
EN 60034-3-74
EN 60034-3-75
EN 60034-3-76
EN 60034-3-77
EN 60034-3-78
EN 60034-3-79
EN 60034-3-80
EN 60034-3-81
EN 60034-3-82
EN 60034-3-83
EN 60034-3-84
EN 60034-3-85
EN 60034-3-86
EN 60034-3-87
EN 60034-3-88
EN 60034-3-89
EN 60034-3-90
EN 60034-3-91
EN 60034-3-92
EN 60034-3-93
EN 60034-3-94
EN 60034-3-95
EN 60034-3-96
EN 60034-3-97
EN 60034-3-98
EN 60034-3-99
EN 60034-3-100

Signature of the Quality Department Officer:
F. SAINT-AUBERT

Signature of the Technical Department Officer:
B. DOUBELIN

Q30 1105 Rev B of 21/09/05

NOTE:
LEROY-SOMER reserves the right to modify its product characteristics at any time to incorporate the latest technological developments. The information contained in this document may therefore be changed without prior warning.

CONTENTS	
1 - PREFACE: TRAINING CE CONFORMITY	18-19
2 - RECEIPT	21
2.1 - Identification	21
2.2 - Storage	21
3 - INSTRUCTIONS	21-25
3.1 - Mechanical installation	21
3.2 - Electrical connection	21
3.3 - Brake with lever	21
3.4 - Electrical advices	22-23
3.5 - LS, LSMVR wiring diagrams	24-25-26
4 - MAINTENANCE	27
4.1 - Adjustments	27
4.2 - Dismantling the brake motor	27
4.3 - Reassembly	27
4.4 - Braking torque	27
5 - BRAKE MOTOR EXPLODED VIEW AND PART LIST	28
5.1 - FCR exploded view	28
5.2 - FCR part list	28
6 - SPARE PARTS	28
6.1 - Procedure	28
6.2 - 1st Maintenance parts	28
7 - TROUBLESHOOTING GUIDE	29
8 - (F)LSPX --- FCR SERIAL	30-32
8.1 - Marking	30
8.2 - Special operating conditions	31
8.3 - Cable gland and tightening capacity	32
8.4 - Variable speed operating	32

INDEX	
Air gap	27
Alarm and early warning	22
Bells	21
Braking torque	27
Brake with lever	21-27
Built-in thermal protection	21-22
Cable gland	21-23-32
Cables: cross-section	21
Connection	21
Coupling	21
Direction of rotation	21
DLRA lever	27
Draining condensation water	22
Drain plug	22-31
Duty cycle	21
Dismantling	27
Earthing	21
Electro-magnet	23
European directives	19-30
Handling	21
IA Food processing industry	21
Identification	21-30
IP 65 protection	31
Lever	21-27
Lifting applications	21
Lifting rings	21
Locking the brake	21
Mounting	21
Nameplate	21-30
Parts	28
Power	21
Power supply	21
Pulleys	21
Reassembly	27
Receipt	21
Reduced response time	21
Replacement parts	28
Space heaters	22
Storage	21
Terminal box	21-32
Thermal protection	22-25
Troubleshooting	29
Variable speed	26
Variable speed for ATEX	32
Wiring diagrams	24

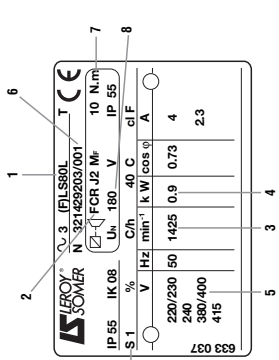
Copyright 2007 : LEROY-SOMER
This document is the property of LEROY-SOMER.
It cannot be reproduced in any form without prior authorisation.
All brand names are registered trademarks.

FCR brake motors are monobloc units consisting of an induction motor and a failsafe brake system (safety brake).

2 - RECEIPT

Check the state of the brake motor - should the motor or even the packaging be damaged in any way, inform the carrier.
Check that the brake motor conforms with the order specifications (mounting arrangement, information on the identification plate).

2.1 - Identification



Following details indicated on name plate:

Motor serial and frame	1
Brake type	2
Speed rotation (min ⁻¹)	3
Power (kW)	4
Motor voltage (V)	5
Manufacturing number	6
Braking torque (N.m)	7
Brake coil voltage (V)	8
Duty cycle	9
(FLSIA Food processing industry	Option

2.2 - Storage

Store the equipment in a clean, dry place, protected from shocks, vibration and temperature fluctuations and at a relative humidity level of less than 90 %.

Special conditions apply if the motor is to be stored for more than 6 months, which we will gladly forward to you if required.
After a storage period of more than 6 months, disconnect the brake power supply unit and check the insulation resistance of the windings (phase / earth resistance greater than 10 MΩ).

3 - INSTRUCTIONS

3.1 - Mechanical installation

(refer also to maintenance ref 1889)

Allow a minimum gap of 210 mm at the rear of the brake motor for removing the cover (servicing and brake adjustment).

Install the brake motor in an environment which meets the order specifications (temperature, relative humidity, altitude).
If the brake motor is supplied with eye bolts, they are only designed to lift the brake motor.

Mount the brake motor in its intended position, on a level, firm surface to avoid distortion and vibration.

Ensure that the correct tightening torque is used for the fixing screws (minimum class 8.8 according to ISO 898-1). The diameter of the screws should correspond to the size of the fixing holes.

3.4 - Electrical advices

Thermal protection and space heaters

Type	Operating principle	Operating curve	Breaking capacity (A)	Protection provided	Mounting Number required*
Normally closed thermostat PTO	bimetallic strip, indirectly heated, with N/C contact		2.5 at 250 V with cos φ 0.4	general surveillance for non-transient overloads	Mounted on control circuit 2 or 3 in series
Normally open thermostat PTF	bimetallic strip, indirectly heated, with NO contact		2.5 at 250 V with cos φ 0.4	general surveillance for non-transient overloads	Mounted on control circuit 2 or 3 in parallel
Positive temperature coefficient thermistor CTP	Variable non-linear resistor, indirectly heated		0	general surveillance for transient overloads	Mounted with associated relay on control circuit 3 in series
Thermocouples T (T < 150 °C) Constantan copper K (T < 1000 °C) Copper-Nickel	Peltier effect		0	continuous surveillance at hot spots at regular intervals	Mounted on control panels with associated reading device (or recording device) 1 per hot spot
Platinum resistance thermometer PT 100	Variable linear resistor, indirectly heated		0	high accuracy continuous surveillance at key hot spots	Mounted on control panels with associated reading device (or recording device) 1 per hot spot

- N.R.T. : nominal running temperature
- The N.R.T.'s are chosen according to the position of the sensor in the motor and the class of temperature rise.
- The number required affects the protection of the windings.

Alarm and early warning

All protective equipment may be backed up by another type of equipment (with a different N.R.T.). The first device will then act as an 'early warning' system (light or sound signals given without shutting down the power circuits), and the second device will be the actual alarm, shutting down the power circuits.

Protection against condensation: Space heaters

Identification: 1 red label
A glass fibre flexible resistor is fixed on 1 or 2 coil end turn(s) which heats the machines when stopped and therefore prevents any condensation inside the machines.
Power supply: 230 V single phase unless otherwise requested by the customer.

The drain plugs underneath the motor should be opened approximately every six months. They should then be replaced to ensure IP -- motor protection.

Thermal magnetic protection

The motor must be protected by a thermal magnetic device, sited between the isolating switch and the motor. These protective devices safeguard motors fully from non-transient overloads.
This device can be fitted with a fused circuit-breaker.

Built-in direct thermal protection

For low rated currents, bimetallic strip-type protection may be used. The line current passes through the strip, which shuts down or restores the supply circuit as necessary. The design of this type of protection allows for manual or automatic reset.

Built-in indirect thermal protection

The motors can be equipped with optional heat sensors; these sensors can be used to monitor temperature rises at 'hot spots':

- overload detection,
- cooling check,
- monitoring strategic points for installation maintenance.

It must be emphasized that these sensors cannot ever be used to directly control the motor operating cycles.

Thermal protection



Caution: whatever the type of protection, (PTO or PTF), its N.R.T. must not exceed:

- 150 °C max for the stator and 120 °C max for the shields if the maximum surface temperature = 125 °C.
- 160 °C max for the stator and 130 °C max for the shields if the maximum surface temperature = 135 °C.
- 170 °C max for the stator and 140 °C max for the shields if the maximum surface temperature = 145 °C.

If using sensors with variable resistances or thermocouples, the associated equipment must stop the motor at a temperature of:

- 150 °C max for the stator and 120 °C max for the shields if the maximum surface temperature = 125 °C.
- 160 °C max for the stator and 130 °C max for the shields if the maximum surface temperature = 135 °C.
- 170 °C max for the stator and 140 °C max for the shields if the maximum surface temperature = 145 °C.

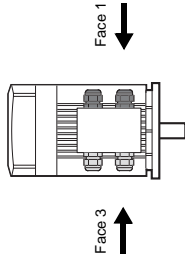
Line protection: Setting the thermal protective device

This must be set at the level of current shown on the motor nameplate for the voltage and frequency of the connected mains supply.

Terminal box is drilled as standard with holes on face 1 and 3:

- LS 71 up to 132 S :
- 2 x (ISO M20x1.5 + ISO M20x1.5) :
- LS 132 M :
- 2 x (ISO M25x1.5 + ISO M20x1.5).

It is delivered closed by obturator plug.
A cable gland kit is supplied following chart below, including ISO20c for separate supply (as plug if not used).



Terminal box and cable gland for FCR brake motors : serial LS, LSMV, for rated supply voltage of 400 V, standard polyamide cable gland ; serial FLS : clamping brass cable gland p. 32.

Frame size	Terminal box material	Single speed motor			2-speed motors			Cable gland for accessories ¹		
		Starting	YΔ	D.O.C.	1 winding Dahlander	2 windings 1 voltage	2 windings 2 voltage	Accessories (see) qty	1 or 2	> 2
71	LS : Aluminium alloy	-	-	ISO 20b ISO 20c	ISO 20b ISO 20c	ISO 20b ISO 20c	2 x ISO 20b ISO 20c	ISO 20c	ISO 20b	
80	LS : Aluminium alloy FLS : Cast iron	-	-	ISO 20 ISO 20c	ISO 20 ISO 20c	ISO 20 ISO 20c	2 x ISO 20 ISO 20c	ISO 20c	ISO 20b	
90	LS : Aluminium alloy FLS : Cast iron	-	-	ISO 20 ISO 20c	ISO 20 ISO 20c	ISO 20 ISO 20c	2 x ISO 20 ISO 20c	ISO 20c	ISO 20b	
100	LS : Aluminium alloy FLS : Cast iron	2 x ISO 20	-	ISO 20 ISO 20c	ISO 20 ISO 20c	ISO 20 ISO 20c	2 x ISO 20 ISO 20c	ISO 20c	ISO 20b	
112-132 112	LS : Aluminium alloy FLS : Cast iron	2 x ISO 20	-	ISO 20 ISO 20c	ISO 20 ISO 20c	ISO 20 ISO 20c	2 x ISO 20 ISO 20c	ISO 20c	ISO 20b	
132 SM, M	LS : Aluminium alloy FLS : Cast iron	2 x ISO 25	-	ISO 25 ISO 20c	ISO 25 ISO 20c	ISO 25 ISO 20c	2 x ISO 25 ISO 20c	ISO 20c	ISO 20b	
160 MP, LR	LS : Aluminium alloy	2 x ISO 25	-	ISO 25 ISO 20c	ISO 25 ISO 20c	ISO 25 ISO 20c	2 x ISO 25 ISO 20c	ISO 20c	ISO 20b	

1. Thermal protection (PTD, PTF...), resistors... For LSMV serial, please refer to column: > 2 accessories, for CTP thermistors delivered as standard.

Tightening capacity and torque of cable gland (NFEN 50 262 standards)

Cable gland type	Standard polyamide cable gland			Tightening torque		
	min cable (mm)	max cable (mm)	Gland nut (N.m)	Gland nut (N.m)	Body (N.m)	
ISO 20c	5.5	8.5	1.5	1.5	2.5	
ISO 20b	7	10.5	2	2	3	
ISO 20	9.5	15	2.5	2.5	3	
ISO 25	13	19	4.5	4.5	5.5	



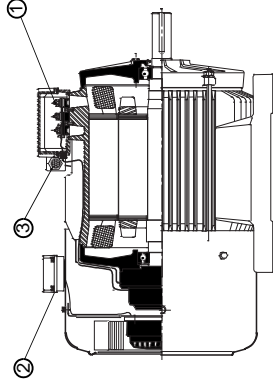
Polyamide cable gland supplied as standard for LS

Electro-magnet characteristics (at 20°C) ± 5 %

Brake motor type	180 V Brake coil voltage			100 V Brake coil voltage			20 V Brake coil voltage		
	Current	Resistance	Power	Current	Resistance	Power	Current	Resistance	Power
LS 71 FCR	0.27	685	49	0.21	561	26	0.46	219	46
(F)LS 80 FCR	0.31	572	57	0.29	418	35	0.54	186	54
(F)LS 90 FCR	0.35	510	64	0.42	286	51	0.65	155	65
LS 100 FCR	0.35	510	64	0.42	286	51	0.65	155	65
FLS 100 - (F)LS 112 FCR	0.44	412	79	0.79	127	79	0.79	127	79
LS 132 S FCR	0.44	412	79	-	-	-	0.79	127	79
(F)LS 132 (SM) FCR	0.5	361	90	-	-	-	0.85	118	85
(F)LS 132 M FCR	0.79	228	142	-	-	-	1.4	71	140
LS 160 MP, LR FCR	0.79	228	142	-	-	-	1.4	71	140

1. (F)LS 132 M with braking torque = 40 to 80 N.m
2. (F)LS 132 M with braking torque = 105 to 160 N.m

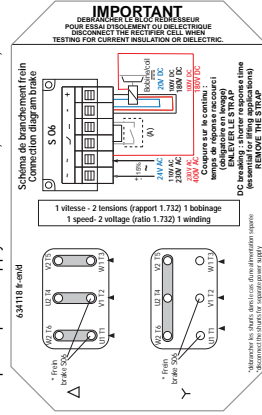
3.5 - Wiring diagrams



① 3 PHASE BRAKE MOTORS

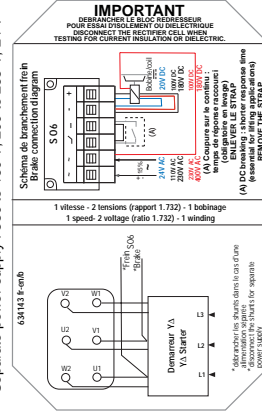
1 speed, D.O.L. starting, 50/60 Hz

Built-in power supply : 350 to 460 V, 200 to 265 V
Separate power supply : 350 to 460 V, 200 to 265 V, 24 V



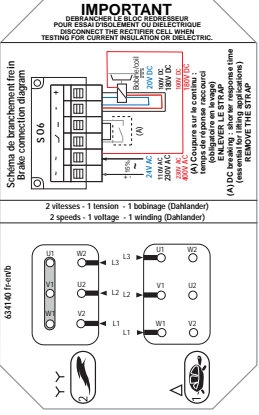
1 speed, Y Δ starting, 50/60 Hz

Built-in power supply : 350 to 460 V, 200 to 265 V
Separate power supply : 350 to 460 V, 200 to 265 V, 24 V



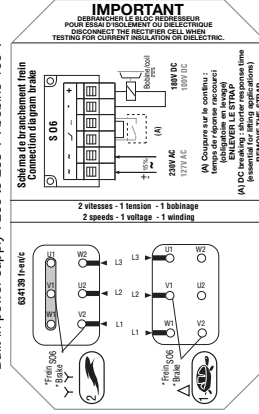
2 speeds Dahlander, 1 voltage, 50/60 Hz

Built-in power supply : 350 to 460 V, 200 to 265 V, 24 V



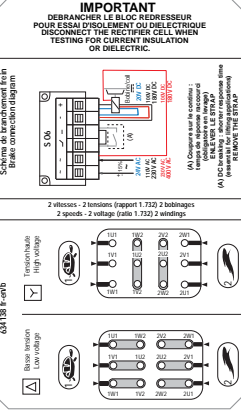
2 speeds Dahlander, 1 voltage, 50/60 Hz

Built-in power supply : 350 to 460 V, 200 to 265 V, 24 V



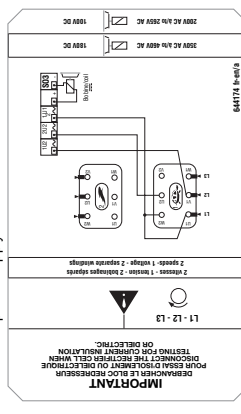
2 speeds, 2 windings, 50/60 Hz

Built-in power supply : 350 to 460 V, 200 to 265 V, 24 V



2 speeds, 2 windings, 1 voltage, 50/60 Hz

Built-in power supply : 350 to 460 V, 200 to 265 V, 24 V



2 speeds, 2 windings, 2 voltage, 50/60 Hz
(Δ/Y) : LS 80 à 160
Built-in power supply : 200 to 265 V, bobine 100 V

684127 Frein
Brake motor
Low voltage

684127 Frein
Brake motor
Low voltage

684127 Frein
Brake motor
Low voltage

684127 Frein
Brake motor
Low voltage

2 speeds, 2 windings, 1 voltage, 50/60 Hz
Separate power supply : 350 to 460 V, 200 to 265 V, 24 V

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

2 speeds, 2 windings, 2 voltage, 50/60 Hz
Separate power supply : 350 to 460 V, 200 to 265 V, 24 V

684127 Frein
Brake motor
Low voltage

684127 Frein
Brake motor
Low voltage

684127 Frein
Brake motor
Low voltage

684127 Frein
Brake motor
Low voltage

2 speeds, 2 windings, 1 voltage, 50/60 Hz
Separate power supply : 350 to 460 V, 200 to 265 V, 24 V

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

1 speed, 1 windings, 2 voltage, 50/60 Hz
Built-in power supply : 400 to 480 V, 200 to 240 V
Separate power supply : 400 V, 230 V, 24 V

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

1 speed, 1 windings, 2 voltage, 50/60 Hz
Built-in power supply : 400 to 480 V, 200 to 240 V
Separate power supply : 400 V, 230 V, 24 V

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

1 speed, 1 windings, 2 voltage, 50/60 Hz
Built-in power supply : 400 to 480 V, 200 to 240 V
Separate power supply : 400 V, 230 V, 24 V

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

1 speed, 1 windings, 2 voltage, 50/60 Hz
Built-in power supply : 400 to 480 V, 200 to 240 V
Separate power supply : 400 V, 230 V, 24 V

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

LEROY-SOMER

INSTALLATION AND MAINTENANCE

2908 - 05.2007 / p

(F)LS - (F)LSIA - LSMV - (F)LSPX - FCR

3-phase asynchronous TEFV brake motors

VARMECA BRAKE MOTORS
Built-in power supply

684146 Frein
Brake motor
High voltage

684146 Frein
Brake motor
High voltage

684146 Frein
Brake motor
High voltage

684146 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

2
SINGLE-PHASE FORCED VENTILATION 230 or 400 V
for frame 80 -> 132

684146 Frein
Brake motor
High voltage

684146 Frein
Brake motor
High voltage

684146 Frein
Brake motor
High voltage

684146 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

3
INCREMENTAL ENCODER

684146 Frein
Brake motor
High voltage

684146 Frein
Brake motor
High voltage

684146 Frein
Brake motor
High voltage

684146 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

PRECAUTIONS DURING CONNECTION

684146 Frein
Brake motor
High voltage

684146 Frein
Brake motor
High voltage

684146 Frein
Brake motor
High voltage

684146 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

684147 Frein
Brake motor
High voltage

LEROY-SOMER

26

4 - MAINTENANCE

Always disconnect the brake motor from its power supply before working on the brake.

4.1 - Adjustments

Adjusting the air gap

The air gap needs to be adjusted when the release mechanism no longer functions normally.

- Unscrew the handle of the lever **53.1** when fitted (following procedure §4.2).

- Unscrew the coverscrews **40** which keep the steel cover **23** in place.
- Remove the steel cover **23**. Unscrew the brake nut **24**, and remove the sealing ring **50**. Clean the parts: removal of lining's friction dust. Insert a 0.4 mm shim between the brake shield **8** and the armature **11**. Tighten the brake nut **24** so as to obtain working play of 4/10th between armature **11** and brake shield **8** (the shim should slip slightly).
- The brake nut **24** should be changed after 3 adjustments.
- Replace the sealing ring **50**. Replace the lever **53** (following procedure §4.3).
- Replace the steel cover **23** and tighten the cover screws **40**.

Adjusting the braking torque

- The braking torque depends on the number of springs and their colour: use the values shown in the table on §4.4.

4.2 - Dismantling the brake motor

- Dismantle the brake motor using the correct tools (hub remover, bearing remover, plastic or leather mallets, correctly sized keys and screwdrivers, circlip pliers, etc.).
- Disconnect the brake motor from its power supply.
- Open the terminal box, locate the wires and mark their position (power supply to the motor and the brake, probes, etc.).
- Disconnect the power supply wires from the motor terminal block and the brake power supply unit (4 and - terminals).
- Unscrew the handle of the lever **53.1** when fitted (following procedure §4.3).
- Unscrew the cover screws **40**, remove the steel cover **23**.
- Remove the brake nut **24**.
- Remove the sealing ring **50**.
- Place an extractor with 2 arms pressing on the end of the shaft and two arms on the armature pins **11**.
- Remove the brake lining fan **15** and the armature **11**.
- Mark the position of the springs **28** and remove them.
- Unscrew the assembly rods **5**.
- Put aside the front shield **3**.
- Pull out the stator housing **1** taking care not to damage the winding.
- Remove the internal circlip **6** to free the brake shield **8**.
- Clean the parts:
 - by blowing the electrical parts (do not use solvents or products containing moisture);
 - using a non slippery degreasing agent for the mechanical parts;
- using a scraper for the flanges;
- if parts **11** and **15** are slippery: change part **15** and degrease part **11** with a non slippery degreasing agent.

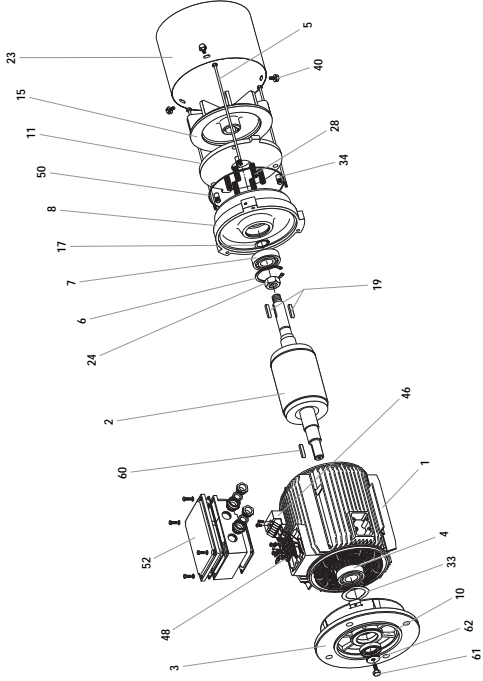
- Change the seals and the bearings.

4.4 - Braking torque (N.m)

No. of springs	LS 71 FCR		(F)LS 80 FCR		(F)LS 90 FCR		FLS 100 - (F)LS 112 FCR		LS 132 SF CR		(F)LS 132 M FCR		LS 160 FCR	
	Colour	N.m	Colour	N.m	Colour	N.m	Colour	N.m	Colour	N.m	Colour	N.m	Colour	N.m
3	white	1.2	blue	2	green	4	red	16	red	16	yellow	40	yellow	50
4	white	1.6	blue	3	green	6	red	22	red	22	yellow	50	yellow	50
5	white	2	blue	3.5	green	8	red	32	red	32	yellow	80	yellow	105
6	white	2.4	blue	4.5	green	9	red	43	red	43	yellow	105	yellow	120
8	-	-	-	-	-	-	red	43	red	43	yellow	120	yellow	160
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	blue	4	green	6	grey	15	-	-	-	-	-	-	-	-
4	blue	5	green	8	grey	20	-	-	-	-	-	-	-	-
5	blue	6	green	10	grey	25	-	-	-	-	-	-	-	-
5	-	-	-	-	grey	32	-	-	-	-	-	-	-	-
6	blue	7.5	green	12	grey	32	-	-	-	-	-	-	-	-

5 - EXPLODED VIEW AND PARTS LIST FCR BRAKE MOTOR

5.1 - FCR exploded view



5.2 - FCR parts list

Ref.	Description	Qty	Ref.	Description	Qty	Ref.	Description	Qty
1	Stator housing	1	10	Seal	1	34	Spined pins	3
2	Rotor shaft	1	11	Armature	1	40	Cover screws	3
3	Front shield	1	15	Brake lining fan	1	46	Cover power supply unit	1
4	D.E. bearing	1	17	External circlip	1	48	Motor terminal block	1
5	Assembly rods	4	19	Keys	2	50	Sealing ring	1
6	Internal circlip	1	23	Steel cover (A : ABS)	1	52	Terminal box	1
7	Brake bearing	1	24	Brake nut	1	60	D.E. key	1
8	Brake shield	1	28	Springs	2 to 6	61	D.E. screw	1
			33	Flexible washer	1	62	D.E. washer	1

6 - SPARE PARTS

6.1 - Procedure

All orders for replacement parts must quote:

- the complete motor type, its number and the information given on the nameplate (see §1);
- number and designation of parts (the part numbers can be found on the exploded view §5.1 and their description in the parts list §5.2).

or M1 integral mounting) and details of gearbox, when fitted.

In order to ensure the safety and good working order of our brake motors, we recommend the use of original manufacturer replacement parts.

If this advice is not followed, the manufacturer cannot be held responsible for any subsequent damage.

In the case of flange mounted motors indicate the type of flange and its dimensions Ø PCD (B5 for flange-mounted, B14 for face-mounted

6.2 - Wearing parts

Parts number	LS 71 FCR	(F)LS 80 FCR	(F)LS 90 FCR	LS 100 FCR	FLS 100 - (F)LS 112 FCR	LS FCR 132 S	(F)LS 132 M FCR	LS 160 FCR
4	6004 2RS	6204 2RS	6205 2RS	6206 2RS	6206 2RS	6208 2RS	6308 2RS	6309 2RS
7	6202 2RS	6204 2RS	6205 2RS	6205 2RS	6205 2RS	6206 2RS	6307 2RS	6307 2RS
10	20×38×8	20×38×8	25×40×7	30×47×5	30×48×8	40×62×7	40×62×7	72×45×8
11							armature	
15							brake lining fan	
34							spined pin	
50	101.19 × 3.53	120 × 4	136.12 × 3.53	136.12 × 3.53	164.7 × 3.53	164.7 × 3.53	209.14 × 3.53	209.14 × 3.53

8.2 - Special operating conditions

- **Thermal protection** (see §3.4)
- **Space heaters** (see §3.4)

- **Temperatures: storage and ambient**
Note: Ta = ambient temperature

If it has been stored at a temperature lower than -10 °C, heat the motor and turn the shaft manually before operating the machine. If used at a temperature lower than -25 °C, the motor does not require a temperature sensor to be fitted. It can be fitted with thermocouples.
Our standard motors are intended to operate at an ambient temperature between -25 °C and 40 °C.
If -25 °C > Ta > -40 °C, the shaftway seals must be silicon and the fan must be metal.
If -25 °C > Ta ≥ -40 °C or (and) if 50 °C < Ta ≤ 60 °C, the terminal box flat seals must be created using silicon or polyurethane mastic.

- **Surface temperature**

As standard, the maximum surface temperature of our LSPX, FLSPX motors is 125 °C with a maximum ambient temperature of ≤ 40 °C. Without derating the motor, the maximum surface temperature will be:

- 135 °C if 40 °C ≤ Ta ≤ 50 °C
- 145 °C if 50 °C ≤ Ta ≤ 60 °C

- **Installation zones**

Our LSPX, FLSPX motors conform to IP 65 protection and we guarantee their surface temperature. They are therefore intended for use in atmospheres containing explosive dust - group II - Category 2 (zone 21) or Category 3 (zone 22).

- **Connection**

Particular attention must be paid to the nameplate so as to choose the correct type of connection for the supply voltage.

- **Earthing**

Earthing the motor is compulsory and must be performed in accordance with existing regulations (protection of workforce).

- **Seals**

After removing the drain plugs, replace them in order to ensure that the motor conforms to IP 65 protection. Replace the removed seals with new seals of the same type. Clean the orifices and plugs before replacing.

On removal, and at least once a year, replace seals on the shaftway, the shield spigots and the terminal box cover with new seals of the same type, after cleaning the parts. The shaftway seals must be fitted using grease of the same type as the bearings.

- **Workforce safety**

Protect all rotating devices before power-up.
If running a motor without fitting a coupling device, carefully immobilise the key in its location.

All measures must be taken to ensure protection from the risks presented by rotating parts (sleeve, pulley, belt, etc.).
Beware of backdriving when the motor is switched off: it is necessary to take appropriate precautions:
- pumps, install a non-return valve, for example.

- **Contactors - Isolators**

In all cases, the contactors, isolators, etc. must be installed and connected in an enclosure offering a degree of protection and surface temperature compatible with the installation zone, or outside danger zones (outside zones 20, 21 and 22).

- **Shock resistance**

The motor can stand a weak mechanical shock (IK 08 according to EN 50-102). The user must provide additional protection if there is a risk of greater mechanical shock.

- **Bearing maintenance**

When you detect on the motor:

- a noise or abnormal vibration,

- abnormal temperature rise in the bearing even though it is lubricated correctly, the state of the bearings must be checked.
Damaged bearings must be replaced as soon as possible to prevent worse damage to the motor and the driven equipment.
When one bearing needs to be replaced, **the other bearing must also be replaced**.

The free bearing allows the rotor shaft to expand (make sure it is identified during dismantling).

- **IP 65 protection for the motor**

Whenever the motor is dismantled, during on-site preventive maintenance, replace the seals for the shaftway, the shield spigots and the terminal box cover with new seals of the same type, after cleaning the parts. The shaftway seals must be reassembled using grease of the same type as used on the bearings.

Whenever the drain plugs are removed, they must be replaced to ensure IP 65 protection for the same motor. Replace used seals with new seals of the same type. Clean the orifices and plugs before reassembly.

After removing the terminal box cover, replace the shaftway, the shield spigots and the terminal box cover with new seals of the same type after cleaning the parts; if its state no longer guarantees the required degree of protection.

8.3 - Cable gland and tightening capacity

Adapt the cable gland and its reducer or amplifier if fitted to the diameter of the cable being used.
In order to preserve the motor's original IP 65 protection, it is essential that the cable gland is correctly fitted and the cable is tightened correctly. The cable gland (so that it cannot be unscrewed by hand).
Unused cable glands must be replaced with threaded plugs.
Unused orifices must also be covered by threaded plugs. It is essential that the cable gland devices or plugs are fitted with the aid of a Perbunan, silicon or polyurethane mastic seal between the cable glands, the plugs, the reducers or (and) the amplifiers, the support or terminal box.

The installer is responsible for ensuring that the cable path is sealed to IP 65.

8.4 - Variable speed utilisation

Special precautions need to be taken when these motors are powered by a frequency inverter or voltage controller.

The reference voltage (drive output or motor input) is 400 V at 50 Hz. The drive should deliver a constant voltage/frequency signal to the motor.

The operating range is limited to 25 to 50 Hz for 50 Hz supplies and for 50 Hz motors designed with natural cooling.

The drives and probe connection devices must be installed outside danger zones (outside zones 20, 21 and 22).

Regardless of the number of poles, the speed must never exceed 3600 min⁻¹.

Motors supplied by a frequency inverter must be fitted with winding sensors and a sensor on the DE shield if appropriate. These sensors must be connected to a motor cut-off device placed outside the explosive zone, so that the maximum surface temperature (indicated on the device) is never reached (see §3.4).

- Particular points:**

- forced ventilation is forbidden.
- incremental encoder utilisation requires ATEX homologation (IP 65) of the encoder.

TERMINAL BOXES AND CABLE GLANDS OF BRAKE MOTORS (FOR ZONE 21, MARKING I2D Tmax125 °C IP 65)

LSPX, FLSPX brake motor serial, for rated supply voltage of 400 V, clamping brass cable gland

Frame size	Terminal box material	Single speed motor			2 speed motors		cable gland for accessories ¹	
		YΔ Starting	D.O.L. starting	1 winding Dalhandler	2 windings 1 voltage	2 windings 2 voltage	Accessories qty 1 ou 2	Accessories qty > 2
71	LS : Aluminium alloy FLS : Cast iron	-	ISO 16 ISO 16	ISO 16 ISO 16	ISO 16 ISO 16	2 × ISO 16 ISO 16	ISO 16	ISO 16
80	LS : Aluminium alloy FLS : Cast iron	-	ISO 20 ISO 16	ISO 20 ISO 16	ISO 20 ISO 16	2 × ISO 20 ISO 16	ISO 16	ISO 16
90	LS : Aluminium alloy FLS : Cast iron	-	ISO 20 ISO 16	ISO 20 ISO 16	ISO 20 ISO 16	2 × ISO 20 ISO 16	ISO 16	ISO 16
100	LS : Aluminium alloy FLS : Cast iron	2 × ISO 20 ISO 16	ISO 20 ISO 16	ISO 20 ISO 16	ISO 20 ISO 16	2 × ISO 20 ISO 16	ISO 16	ISO 16
112 132 112 M	LS : Aluminium alloy FLS : Cast iron	2 × ISO 20 ISO 16	ISO 20 ISO 16	ISO 20 ISO 16	ISO 20 ISO 16	2 × ISO 20 ISO 16	ISO 16	ISO 16
132 SM, 132 M	LS : Aluminium alloy FLS : Cast iron	2 × ISO 25 ISO 16	ISO 25 ISO 16	ISO 25 ISO 16	ISO 25 ISO 16	2 × ISO 25 ISO 16	ISO 16	ISO 16
160	LS : Aluminium alloy	2 × ISO 25 ISO 16	2 × ISO 25 ISO 16	2 × ISO 25 ISO 16	2 × ISO 25 ISO 16	2 × ISO 25 ISO 16	ISO 16	ISO 16

¹ : thermal protection (P70, PTF...), resistors...

ISO 16 cable gland is delivered with thread reducer M20M16.



Clamping brass cable gland certified EExe supplied as standard

Tightening capacity and torque of cable gland (NFEN 50 262 standards)

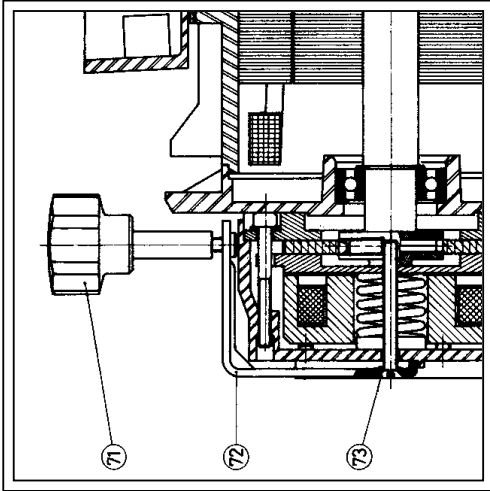
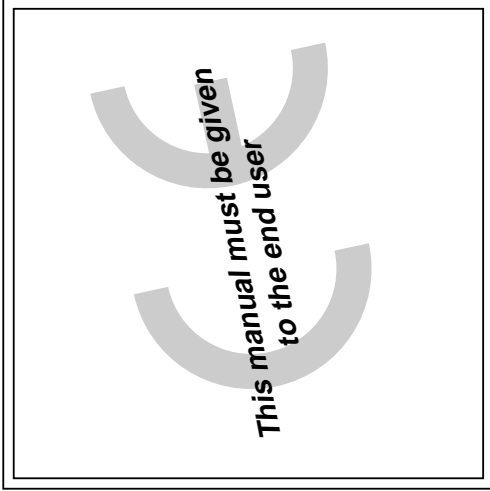
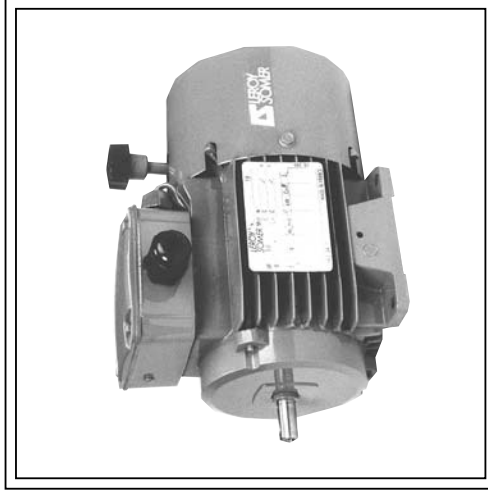
Clamping brass cable gland			
Cable gland type	Tightening capacity		Tightening torque
	Ø min cable (mm)	Ø max cable (mm)	Gland nut (N.m)
ISO 16 ¹	6.5	11	2.5
ISO 20	7.5	13	4
ISO 25	12.5	18	6

¹ : ISO 16 cable gland is delivered with thread reducer M20M16.

7.5 BRAKE MOTORS FMD

Function / Location	ECL Code	Motor ref.	Power	Brake Ref.	Recommended Braking Torque N.m
(x1) 36T tapping tool / Hook rotation	1-10-886-91	LS 71	0,18 kW	FMD	2,5 Nm 20%





FMC brake motor

Installation and maintenance

GN 0030 01 a

FOREWORD

- This brake motor is designed to operate in conjunction with LEROY-SOMER induction or D.C. motors
- LEROY-SOMER reserves the right to change the characteristics of its products at any time, in order to incorporate the latest technological developments. The information contained in this document may therefore be changed without notice.

- **This brake motor cannot be used for lifting operations : safety of personnel.**
- **This brake motor must be installed by qualified personnel and must conform to the instructions set out below.**
- **The specifications, instructions and descriptions relate to standard use. They do not take account of any variation in construction or special adaptation.** Failure to follow these recommendations may lead to premature wear and tear on the motor and to the manufacturer's guarantee no longer applying.

1 - GENERAL

The FMC brake motor is a failsafe brake motor. This brake motor can be supplied with or without manual release. The braking torque can be 1.5 mN (blue spring) or 2.5 mN (white galvanised spring). The coil is supplied by D.C. or rectified current (dual half-wave). Rectifier integrated in the terminal box : 2 "orange" wires for A.C. supply and 2 "purple" wires for connection to the brake. Brake disc : in asbestos-free friction linings. Brake motor operating conditions :

- Explosive, harsh or damp atmospheres should be avoided.
- Protection IP 40.
- Ambient operating temperature 0-40°.

2 - INSTALLATION

Before connection, ensure that the electrical supply to the installation is switched off

- 2.1 - Single speed induction motors - LS series in finned housing
- 2.1.1 - Power supply - Connection
- 2.1.1.1 - Integral power supply
- A.C. supply via connection to the terminal plate of a THREE-PHASE OR SINGLE PHASE motor, plus integral rectifier connected on the terminal plate.

A.C. motor voltage	D.C. brake voltage
Standard case : 230/400 3-ph or 220V single-ph	196V
Other cases : 254/440 3-ph or 254V single-ph	225V
125V single phase	112V
110V single phase	97V
48V single phase	41V
24V single phase	19V

For connection, refer to the motor connection diagram located in the terminal box and the voltage(s) indicated on the motor identification plate.

- 2.1.1.2 - **Separate power supply**
Supply the D.C. coil with the following voltages : 12 - 19 - 24 - 41 - 48 - 97 - 112 V.

FMC brake motor

The cable from the brake is connected in the motor terminal box.

To connect, power the brake cable with the voltage indicated on the brake motor identification plate or on the end of the cable. (To read the brake motor identification plate on ventilated motors, remove the fan cover).

2.1.1.3 - Relative separate power supply

Via the integral rectifier : Single phase A.C. supply from the integral rectifier (double diode bridge). A.C. input voltage : see table in section entitled "Integral power supply" (or indicator plate under the cover in the terminal box).

To connect : Read the brake motor supply voltage on the brake motor identification plate or on the end of the cable. Power the 2 unconnected "orange" A.C. wires on the rectifier with the corresponding A.C. voltage.

Note : For motors with no terminal box, the brake motor always has a separate motor supply.

2.2 - Two-speed induction motors

Please consult LEROY-SOMER.

2.3 - D.C. motors

2.3.1 - Motors with terminal box

2.3.1.1 - **Integral power supply**
The brake motor is supplied with the same voltage as the motor and the brake cable is connected on the motor terminal plate. Connect the motor according to the connection diagram.

2.3.1.2 - **Separate power supply**

The brake cable is :

- either connected in the terminal box,
- or left free on the outside.

Power the brake motor with the voltage indicated on the brake motor identification plate or on the end of the cable.

2.3.2 - **Motors without terminal boxes**

2.3.2.1 - **Separate power supply**
Power the brake motor with the voltage indicated on the brake motor identification plate or on the end of the cable.
Possible voltages : 12 - 19 - 24 - 41 - 48 - 97 - 112V.

2.4 - Variable speed motors

2.4.1 - D.C. motors with variable speed control unit (MVS or MVE)

2.4.1.1 - **Integral power supply**
Connected to terminals F1 F2 on the motor, if these exist (MS motor), otherwise on the unit (MFA motor).

2.4.1.2 - **Separate power supply (Same as 2.1.1.2).**

2.4.2 - **Induction motors with variable frequency control unit (FMV 102)**
No integral power supply, only separate power supply is possible (see 2.1.1.2).

3 - STANDARD

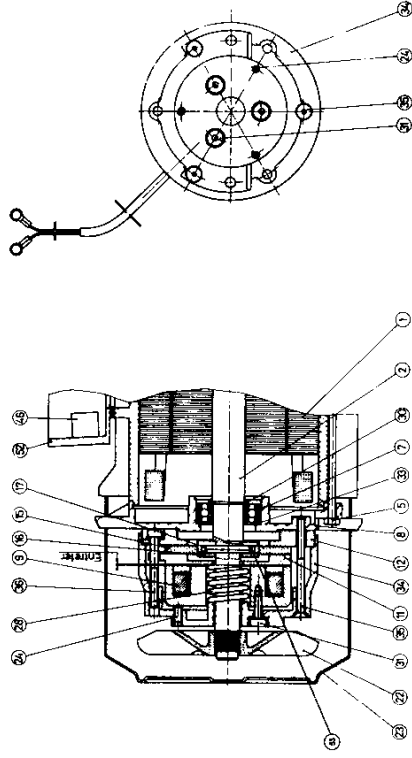
Electromagnetic compatibility

For a standard connection (with rectifier) with unfiltered D.C. voltage, the FMC brake motor conforms to the following EMC requirements :

- Conducted emissions 0.15 - 30 MHz acc. to EN 50081-2
- Immunity to electrostatic discharges acc. to EN 50082-2 (level 3)
- Immunity to transient bursts acc. to EN 50082-2 (level 3)

FMC brake motor

3 - FMC BRAKE MOTOR WITH NO MANUAL RELEASE



NO	QTY	DESCRIPTION
1	1	Housing and wound stator
2	1	Rotor
5	3	Tie rods
7	1	Non-drive end bearing
8	1	Brake shield
9	1	Electro-magnet yoke
11	1	Armature
12	1	Fixed plate
15	1	Brake disc
16	1	Hexagonal hub
17	1	Hub retaining pin
22	1	Fan
23	1	Fan cover

3.1 - Principle

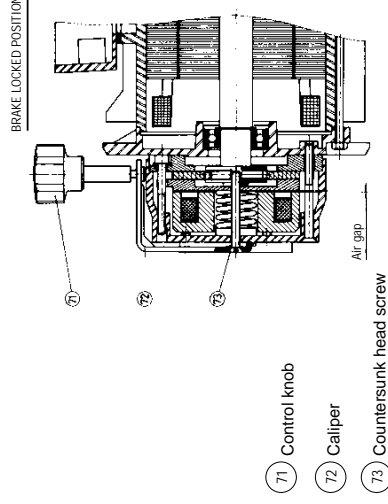
The spring (28) pushes the armature (11) against the brake disc (15) which then pushes against the fixed plate (12). The brake disc (15) is prevented from rotating. The hub (16) which is attached to and therefore rotates with the disc is prevented from rotating, as is the shaft. When the electro-magnet (9) is powered up, the armature (11) is pushed against the electro-magnetic yoke, thus reducing the air gap. The brake disc (15) is thus no longer held tightly between the armature (11) and the fixed plate (12). This allows the hub (16) and the shaft (2) to rotate freely.

3.2 - Adjusting the air gap

⚠ This operation must be carried out with the brakes de-energised and the motor stopped.

- The air gap is factory-set. It may need to be readjusted several hundred operations after the first start-up if the brake disc has become worn.
- Depending on servicing, it may also be necessary to adjust the brake every 50 to 100,000 cycles or more, depending on the braking inertia.
- To adjust the air gap :
 - Remove the cover (23) and the fan (22) if the motor is ventilated.
 - Loosen the 3 screws (31) by several turns.
 - Carefully tighten the 3 screws (24) until they are completely tight.
 - Loosen each of these 3 screws (24) a 1/4 turn. The resulting air gap will be 0.17 mm.
 - Tighten the 3 screws (31) but do not over-tighten.
 - Replace the fan (22), and the cover (23) if the motor is ventilated.

4 - FMC BRAKE MOTOR WITH MANUAL RELEASE



4.1 - Using manual release

There are two release functions using this mechanism :

Function A : Release with instant return.

The brake is released by slightly twisting the knob (71) in the direction of the arrow. When the knob is released, the brake returns to the "on" position.

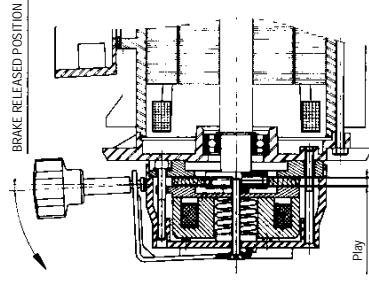
Function B : Release with position maintained.

The brake is released and remains in position by screwing the knob (71). To return the brake to the "on" position, completely unscrew the control knob.

4.2 - Manual release principle

When the control knob (71) is screwed round (Function B) or slightly twisted to the rear, (Function A) the caliper (72) also twists round in the direction of the arrow, pulling on the 2 countersunk head screws (73) which are screwed into the armature (11). The armature is pressed against the electro-magnet (9), reducing the air gap. The brake disc (15) is thus no longer held tightly between the armature (11) and the fixed plate (12). This allows the hub (16) and the shaft (2) to rotate freely.

FMC brake motor



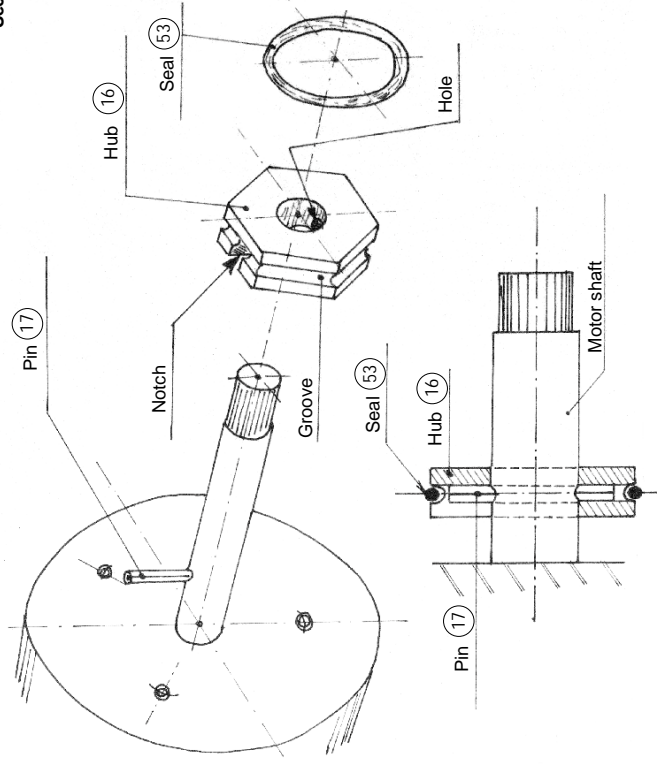
5 - REPLACING THE BRAKE DISC OR THE ELECTRO-MAGNET YOKE

- Remove the cover (23) and the fan (22) (for motors with ventilation).
- Unlock and remove the 3 screws (35).
- Remove the brake block, pulling it towards the rear.
- Unlock and pull out the 3 columns (36) which hold the fixed plate (12).
- Remove the fixed plate (12) taking note of its position in relation to the electro-magnet support (34).
- Take out the brake disc (15).
- Replace the brake disc (15) if this is the part to be replaced.
- If the electro-magnet yoke (9) is to be replaced :
 - Remove the 3 screws (31) which fix the yoke
 - Remove the yoke (9) from the support (34)
 - Replace the yoke (9)
 - Mount the yoke (9) in the support (34), and replace the 3 screws (31) after loosening the 3 adjustment screws (24) by several turns.
 - Replace the fixed plate (12) observing its correct position.
 - Replace and lock the 3 columns (36)
 - Replace the brake block, taking care to fit the brake disc (15) correctly on the hexagonal hub (16)
 - Replace and lock the 3 screws (35)
 - Adjust the air gap as described in the section entitled "Adjusting the air gap".
 - Replace the fan (22) and the cover (23).

FMC brake motor

6 - DISMANTLING AND REASSEMBLING THE HUB

Sectional view



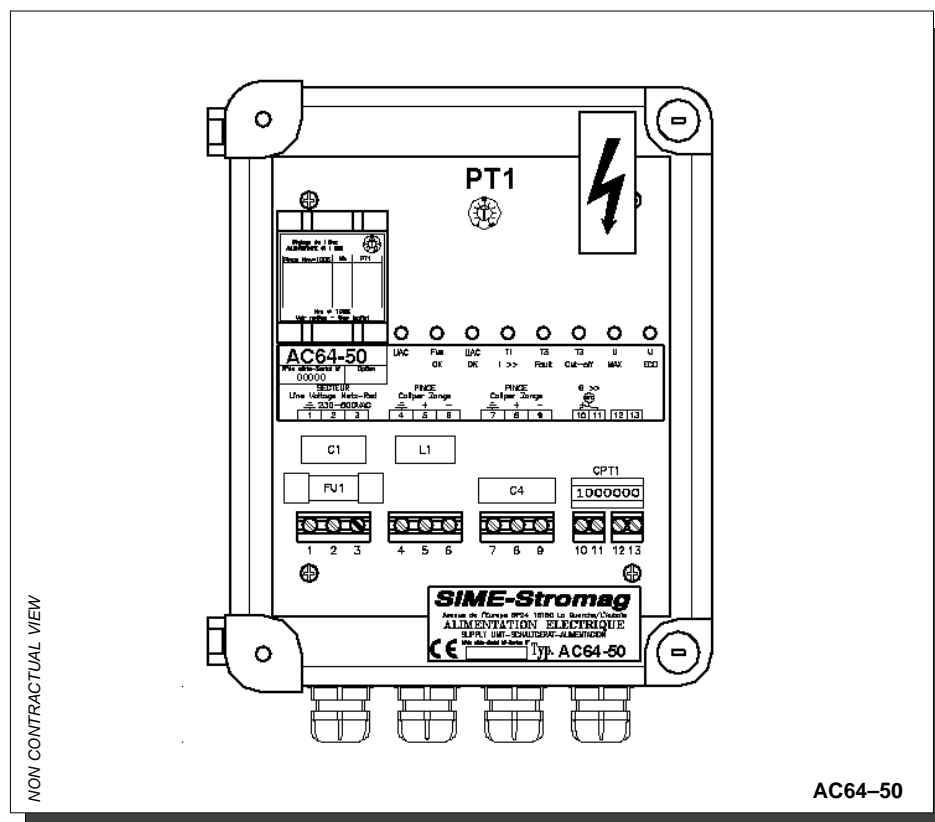
- Remove the cover (23) and the fan (22) (for motors with ventilation).
- Remove the 3 screws (35).
- Remove the brake block, pulling it towards the rear.
- Remove the sealing ring (53) (if there is one) from the hub.
- Pull out the pin (17) and remove the hub (16).
- Push the new pin (17) into the motor shaft ensuring that it does not protrude on the other side.
- Mount a grooved hub (16) on the shaft ensuring that the open notch on the hub is on the side towards the pin. The pin should be firmly embedded in this notch.
- Insert the pin into the hole located on the front of the hub notch using a $\varnothing 2.5$ pin punch and push it home, ensuring that it does not protrude on either side, into the groove.
- Insert the sealing ring (53) in the hub groove. Check that it is pushed right into the groove all the way round.
- Spray all 6 sides of the hub with "Molykote 321 R" aerosol slip oil ensuring that the sealing ring and hub are covered (do not use grease). Any surplus oil, sprayed onto the brake housing or shaft, will be polymerised in the air, and will not cause any problem.
- Replace the brake block on the motor. The brake lining should fit onto the hub and the sealing ring without having to exert much pressure, so as not to damage the sealing ring (without slip oil, the brake lining would twist and cut the seal).
- Fix the brake block using the 3 countersunk head screws (35).

Notes

7.6 COMPENSATED BRAKE ELECTRICAL SUPPLY UNIT

Note : For Compensated brake type **50** (5K), **51** or **52** (SIME) see chapter MECHANICAL INSTRUCTIONS.

- The electrical power unit supply AC64–50 CP are compact power supply operating on alternating single phase mains
- 50 & 50R reference are specific ECL references
- The references 5K & 5KR included in the following supplier documents correspond to the 50 & 50R Ecl Brakes



Disc brakes - Electrical power supply AC64-50 Installation and maintenance

SUMMARY

Chapters	Title	Page
	NOTES AND SYMBOLS	2
1	PRESENTATION	3
2	TECHNICAL DATA	3
3	INSTALLATION	3
4	ELECTRICAL CONNECTION AND LED LIGHTS	4
5	TYPICAL VALUES	5
6	SETTING OF LIMITATION OF MAXIMUM CURRENT (PT1)	5
7	OPTIONS	7
7-1	Anti-condensation option	7
7-2	Closure delay of the caliper option	7
7-3	Steel case option	7
8	MAINTENANCE	8
9	FAULT DIAGNOSIS	8
10	SPARE PARTS	8

If the instructions in this manual are not adhered to, the performances, correct operation and the safety of the equipment cannot be guaranteed.

Disc brakes - Electrical power supply AC64-50 Installation and maintenance

NOTES AND SYMBOLS

According to EC regulations, we use, facing some paragraphs, symbols defining hazards and informing the user about the consequences of not following the instructions of this installation and maintenance leaflet.

DANGER!



This symbol concerns people's safety. It points out situations which could lead to death or serious injuries.

ATTENTION!



This symbol concerns the use of the equipment. It points out situations which could lead to damage or destroy the equipment.

NOTE!



This symbol concerns information which can ease the installation and the use of the equipment.

Standard(s) quoted :

- EN 61000-6-2
- EN 61000-6-4
- EN 60204-1

If the instructions in this manual are not adhered to, the performance, correct operation and the safety of the equipment cannot be guaranteed.

Disc brakes - Electrical power supply AC64-50 Installation and maintenance

1 - PRESENTATION

The not insulated compact power supply type AC64-50 is specially designed for Stromag France brakes control with 50V coil type : 660/650/645 - 5K/5D - 4WD - 4CA.

The caliper opening and closing are controlled by the alternating single phase mains presence or not (230 to 500VAC +/-10%).

A measure of the current allows to regulate and limit current Max injected in caliper(s) at values defined by the potentiometer PT1, to :

- limit maximum air gap where manual compensation calipers (RM) can be opened,
- check the correct operation of automatic compensation calipers,
- decrease heatings and electrical consumption.

The power supply AC64-50 is protected against overloads (FU1), short circuits on caliper output (T1 I>>).

LED lights indicate operating state of power supply.

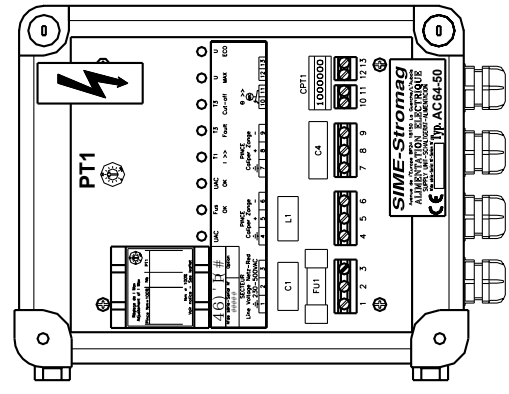
The counter CPT1 indicates the number of cycles made by the power supply.

2 - TECHNICAL DATA

- Single phase voltage : 230 to 500 VAC +/-10% 50/60Hz
- Ambient temperature maximum : -20°C to +60°C
- Polycarbonate casing protection standard with transparent cover : IP66 IK08.
- EC marking of conformity : 73/23/EEC directive BT : 89/336/EEC directive CEM (standards EN61000-6-2, EN61000-6-4 EN60204-1).

3 - INSTALLATION

- The positioning should, preferably, be installed on rigid vertical support.
- The environment must provide proper natural ventilation.



If the instructions in this manual are not adhered to, the performance, correct operation and the safety of the equipment cannot be guaranteed.

Disc brakes - Electrical power supply AC64-50 Installation and maintenance

4 - ELECTRICAL CONNECTION AND LED LIGHTS

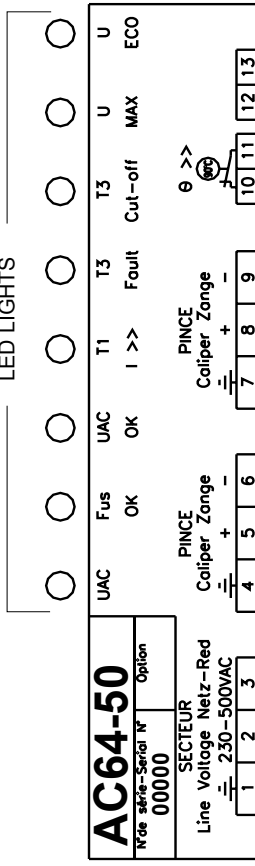
- The opening and closing of caliper(s) must be controlled by an independent contactor plugged on alternating mains input.
- Maximum connecting section = 4mm²
- Cable glands available : 3 PE ISO 20 (Ø 9.5 to 15) and 1 PE ISO 20 (Ø 7.5 to 13).
- Protection against overloads : Internal fuse FU1 4A aM (10x38)
- Protection to be provided by the customer in head of control contactor : see table chapter 5.

ELECTRICAL DANGER !



THIS PRODUCT IS NOT INSULATED
Control and power electronic of power supply is not insulated and is under mains voltage.
The power supply must be installed by qualified personnel, used to handle this equipment type and aware of risks inherent in their utilization.
REMINER : The ground terminal of the calipers must be connected to the supporting structure's ground.

LED LIGHTS



TERMINAL BOX

Terminals Function

1-2-3 Alternating mains input
4-5-6 Caliper output 1
7-8-9 Caliper output 2
10-11 Thermal protection
12-13 Anti-condensation option

Description

Earth + Alternating mains input (between phase and neutral or between phases)
Earth + Caliper output 1 (see cable maximum resistance following the caliper type)
Earth + Caliper output 2 (see cable maximum resistance following the caliper type)
Thermostat switch NC (Maxi Voltage : 250VAC 24VDC - Current Maxi/Mini : 1A/50mA)
Heating resistance 15W 115/230VAC

Lights

UAC Mains current presence
FUS OK Fuse OK
UAC OK Current mains OK
T1 I>> Short circuit caliper
T3 Fault Cut-off circuit Fault
T3 Cut-off Cut-off circuit active
U MAX Current MAX
U ECO Current ECO

Description

Green LED on, in the presence of a mains voltage on terminals 2-3
Green LED on, if fuse is OK
Green LED on, if the mains voltage is correct on terminals 2-3
Red LED on, in case of short circuit on caliper output
Red LED on, if cut-off circuit is on short circuit
Red LED on, if cut-off circuit is opened
Yellow LED on, in the presence of Max current (opening of the brakes)
Green LED on, in the presence of economy voltage (keeping up brakes opened)

If the instructions in this manual are not adhered to, the performance, correct operation and the safety of the equipment cannot be guaranteed.

Disc brakes - Electrical power supply AC64-50 Installation and maintenance

5 – TIPYCAL VALUES

Voltages are independent of mains variations and are measured on terminals of caliper output.

U MAX	Current MAX for caliper opening	70V Maximum
U ECO	Current ECO for keeping up caliper opened	8.5 V +/-1V
t MAX	Time of voltage MAX	0.6s Maximum
U Cut off	Caliper current at mains cut-off	-170V (5ms)

Caliper		660-650-650E	5K-5D-5KR-5DR-5KE-5DE	645	4WD	4CA
Maximum number of calipers		2	2	2	2	1
Resistance at 20°C per caliper		6.68	6.68	4.52	4.52	3.08
Maximum number of actuations per hour and ambient temperature t)		150	1000	150	60	1000
		150	600	150	60	600
Mains current absorbed per caliper		4	4	6	6	9
Maximum return resistance (per caliper) of the connecting cable supply unit-caliper		0.6	0.6	0.75	0.75	1
Protection to be provided on head control contactor on mains input		1	2	1	1	1
		1	2	2	2	4
		1	2	2	2	4

Time of calipers closing : (time between mains cut-off and application of 66% of nominal torque for calipers adjusted at nominal torque).

Calipers	660-5KR-5DR	5K-5D-5KE-5DE-650-650E	645	4WD	4CA
Tr 66 (ms)	100	100	120	300	200

6 - SETTING OF LIMITATION OF MAXIMUM CURRENT (PT1)

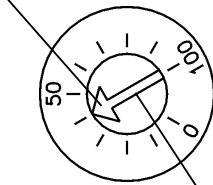
At the delivery, the potentiometer PT1 is setting on 0% (the power supply is inactive).

Values defined by the potentiometer PT1, allow to :

- limit maximum air gap where manual compensation calipers (RM) can be opened,
- control the correct operation of automatic compensation calipers,
- decrease heatings and electrical consumption.

Potentiometer PT1

Position indicator on 40%



For the setting of PT1 use a flat screw driver 3.5mm x 0.75mm.

If the instructions in this manual are not adhered to, the performance, correct operation and the safety of the equipment cannot be guaranteed.

Disc brakes - Electrical power supply AC64-50 Installation and maintenance

The setting label in the power supply gives setting values of PT1 for calipers adjusted at nominal torque (100%Nm).

For calipers adjusted with another value, see the table below :

TORQUE		660	5KR- 5DR	5KE-5DE-650-650E	5K-5D	645	4CA
%Nm	d (mm)	PT1 (%)	d (mm)	PT1 (%)	d (mm)	PT1 (%)	d (mm)
120	No	No	No	No	7.8	30	4.2
100	7.5	25	6.6	25	6.6	25	5.7
85	4.0	25	4.0	20	5.4	22.5	7.3
70	2.3	20	2.6	15	4.8	20	8.2
50	No	15	0.0	15	3.6	17.5	No

Values are given only for a caliper, in case of utilization of the power supply on two identical calipers, double the PT1 setting value.

Example :

2 calipers 5K at nominal torque + 20% :

%Nm = 120 → PT1 = 30% x 2 = 60%

For setting of intermediate value torque, adjust PT1 on the br-que nearest value.

Example :

caliper 660 setting at nominal torque -20% :

%Nm = 80, dimension d = 3.4mm → PT1 setting = 25%

d is the dimension of the torque nut setting, which allows to fix the caliper torque setting.

See leaflets of corresponding calipers :

- Calipers 660-650-645 Leaflet : 8100

- Caliper 650E Leaflet : 815

- Calipers 5K-5KR-5D-5DR Leaflet : 8200

- Calipers 5KE et 5DE Leaflet : 822

- Caliper 4CA Leaflet : 8251

After the setting, check the brake operation is correct.

If the instructions in this manual are not adhered to, the performance, correct operation and the safety of the equipment cannot be guaranteed.

Disc brakes

Technical data and dimensions

Electrical power supply AC64-50 CP

Compact power supply operating on alternating single phase mains.
For SIME-Stromag Disc Brakes with 50 V coil.
type : 660/650/645 - 5K/5D - 4WD - 4CA
Polycarbonate case

Operating Conditions:

- Casing protection standard IP66 IK08
- Ambient temperature : -20°C to +60°C

Electrical Data :

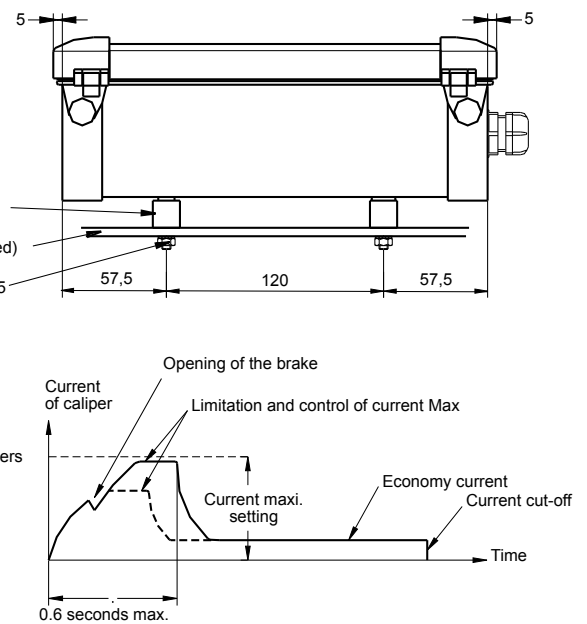
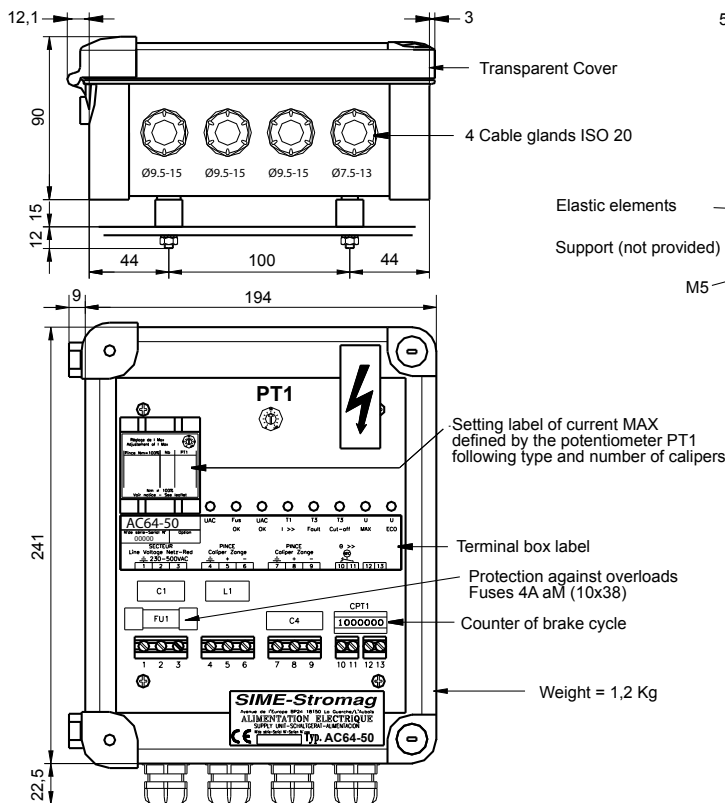
Single phase mains AC
230/500V AC $\pm 10\%$ 50/60Hz

EC marking of conformity :

- 73/23/EEC directive BT
- 89/336/EEC directive CEM
- (standards EN61000-6-2 EN61000-6-4 EN60204-1)

Options:

- Closure delay of the caliper
- Anti-condensation kit
- Steel case IP66 IK09



Time of calipers closing (time between mains cut-off and application of 66% of nominal torque).

Caliper	660-5KR-5DR	650-650E 5K-5D-5KE-5DE	645	4WD	4CA
Tr 66 (ms)	100	100	120	300	200

ELECTRICAL DANGER : THIS PRODUCT IS NOT INSULATED

Control and power electronic of power supply is not insulated and is under mains voltage. The power supply must be installed by qualified personnel, used to handle this equipment type and aware of risks inherent in their utilization.

Caliper	660-650-650E	5K-5D-5KR-5DR-5KE-5DE	645	4WD	4 CA
Maximum number of calipers	2	2	2	2	1
Resistance at 20°C per caliper (Ω)	6.68	6.68	4.52	4.52	3.08
Maximum number of actuations per hour and ambient temperature θ	θ ≤ 40°C	150	1000	150	60
	40°C < θ ≤ 60°C	150	600	150	60
Mains current absorbed per caliper	Max (A)	4	4	6	6
	Economy (A)	0.6	0.6	0.75	0.75
Maximum return resistance (per caliper) of the connecting cable supply unit-caliper (Ω)	2	2	1	1	1
Protection to be provided in head of control contactor on mains input	Number of caliper	1	2	1	2
	Fuse aM (A)	1	2	2	4
	Circuit-breaker curve C (A)	1	2	2	4

Due to continuous development and improvement, all dimensions and characteristics are subject to change without notice.

7.7 LOAD WEIGHING FOR TAPPING TROLLEY DAT 400

Location	ECL Code
(x2) 35T tapping tool lifting ass'y	1-10-103-23



Precise

**DAT 400 Series
Digital Transmitters**

DeviceNet output version

**Installation & Operating
Manual
(version 0.2)**



Precise Instrument Corp.

**76 Winn Street
Woburn, MA 01801**

Tel: 781-937-3115 / Fax: 781-937-3116

Technical Specifications

Power Requirements

Input Voltage
Power Consumption
Isolation
Category II

24 Vdc \pm 15%
7.5 Watts
Class II
Category II

Environmental

Operating Temperature
Storage Temperature
Relative Humidity

+ 14 to + 104°F (-10 to +40°C)
- 4 to + 122°F (-20 to +50°C)
85% non-condensing

Display

Type
Status LED's
Keyboard

6-digit red LED, 7 segment 0.55" (14 mm. high)
(4) Red LED's
(4) Keys (tactile feedback)

Performance

Excitation Voltage
Load Current
Conversion Rate
Resolution
Sensitivity
Linearity
Temperature Creep
A/D Converter
Signal Input Range
Filter
Increment Size
Decimal Point
Calibration Methods

5 volts fixed, short circuit proof
85 mA (six 3500 load cells)
50 updates / second (no filtering)
60,000 counts
0.2 uV / count
< 0.01% of full scale
< 0.001% of FS / °C
24 bits
- 0.5 mV/V to + 3.5 mV/V (- 3.9 mV/V to + 3.9 mV/V optional)
0.1 Hz to 25 Hz selectable
x1, x2, x5, x10, x20, x50
0.0, 0.00, 0.000
Computer interface or via front panel

Inputs & Outputs

(2) Logic Inputs
(2) Logic Outputs
COM 1 Serial Output
COM 2 Serial Output
Maximum Cable Length
COM 1 Standard Protocols
COM 1 Baud Rate
COM 2 Standard Protocol
COM 2 Baud Rate

Opto-isolated, 24 Vdc PNP (requires ext. power supply)
Solid-state relays, (maximum load 24 Vdc / 100 mA each)
RS-232
RS-485
50 feet (15 m.) RS-232, 3900 feet (1200 m.) RS-485
ASCII, Modbus RTU
2400, 9600, 19200, 38400, or 115200 selectable
DeviceNet
125 - 250 - 500 kbps (selectable)

Enclosure

Overall Dimensions
Mounting
Enclosure
Protection (front)
Weight
Wiring Connections

4.17" x 3.54" x 2.28" (106 x 90 x 58 mm.) (L x H x D)
DIN Rail Guide
ABS Plastic
IP20
8 Ounces (230 g.)
Terminal blocks (pitch = 0.196") (5.08 mm.)

Installation

Mounting

Install the instrument in a location where it will not be subjected to excessive heat, humidity or vibration. For best results, avoid direct sunlight on the front of the instrument. The unit should be installed at eye level so as to allow viewing the display and access to the front panel keys.

Cable Types and sizes

Use a 6 x 0.5 mm² shielded cable for the load cell/s connection. Use a 3 x 0.34 mm² shielded cable for the RS-232 connection.
For the DeviceNet output, only certified cables and connectors are admitted.

Power and Wiring Considerations

The instrument is powered from an external 24 Vdc source. The instrument can be operated from a computer; therefore, a "clean" power source is required for reliable operation.

The incoming power should come from a source that is isolated from other process equipment.

Cables carrying primary and switched power should be routed away from load cell and other signal cables to avoid electrical interference.

Relays, motor starters and other inductive devices connected to the equipment must have reliable and effective arc suppression.

Always connect the shield lead where indicated on the drawing, and on one end only.

High voltage devices such as megohmmeters, etc. should *never be used* to check the wiring connections.

Plastic insulating tape should not be used on load cell connections.

Environmental Considerations

Heavy electrical equipment should not be installed close to the weighing equipment.

Excessive vibration will affect the accuracy of the weigh system and depending on the severity can cause damage to electrical and electronic components.

The atmosphere should be dust free and not contain any corrosive gasses or materials which could adversely affect the equipment.

Hazardous areas

If the weighing system will be installed in a hazardous area, please refer to the drawing shown on page 32.

NOTES:

WELDING on or in the vicinity of the equipment is **strictly prohibited**.

STATIC loads, caused by thunderstorms, must be prevented from developing by using reliable lightning conductors.

ENSURE that the cooling of the equipment is not obstructed.

Introduction

This manual provides general information on the installation, configuration, calibration, and operation of the PreciseΣ400 Series Digital Transmitters. The Model 400 features a four-button keyboard, 6-digit Red LED display, and four status LED's. The instrument can be configured and calibrated both via the front panel keys and remotely via the COM 1 serial port. The PreciseΣ400 is packaged in ABS Plastic DIN-Rail mounted enclosure.

All units include the following features:

- + Drives up to six 350 ohm load cells
- + Supports 4 and 6 wire connections
- + RS-232 and RS-485 outputs
- + (2) Logic inputs
- + (2) Logic outputs (setpoints)

The PreciseΣ400 Series Transmitters have three different modes of operation:

Operating mode

In this mode the unit displays gross weight, net weight, or peak force readings as required.

Setup mode

This mode is used for configuration and calibration of the unit.

Test mode

The test mode enables you to test the inputs and outputs.

Front panel key functions - Operating Mode

The "SET" key enables you to enter values for Setpoints 1 and 2. Press the "SET" key. Set 1 appears on the display. Press the "PRG" key to view the current value. To change the current value, press the "O" key to select a digit, then use the "Up" or "DOWN" keys to increment or decrement the value.

Repeat this procedure for the remaining digits, then press the "PRG" key to enter the new value. To change the value for Setpoint 2, press the "SET" key again and repeat the above procedure or press the "O" key to exit.

The "FUN" key is used to switch the unit from Gross mode to Net mode, or Peak Hold mode. To switch to Peak Hold mode, press and hold the "FUN" key until a 'P' appears on the display.

The "O" key is used to zero the unit in Gross mode, tare the unit in Net mode, and reset the value to zero in Peak Hold mode.

The "PRG" key is used to send the data to the RS-232 serial port for use with a computer.

Front panel key functions - Setup Mode

In setup mode three of the front panel keys are used as directional keys to scroll through the various menus. A label on the lower half of each key identifies the direction provided by the key.

The "SET" and "FUN" keys are used to navigate through the main menu and sub-menus. They are also used to increment or decrement the numerical value of a selected digit.

The "O" key is used to move through certain sub-menu parameters, or to select a specific digit when numerical values are displayed. It is also used to return to the main menu from any of the sub-menus.

The "PRG" key switches the unit to the "Basic Configuration" mode. It is also used to enter the sub-menus, and store parameter changes.

The "PRG" key when used in conjunction with the "SET" key switches the unit to the "Complete Configuration" mode. It is also used to enter the sub-menus, and store parameter changes.

Status LED's

There are four status LED's on the front of the unit, one for Motion, one for Net mode, and one for each of the outputs.

Enabling/Disabling front panel keys.

In order to prevent any access to the instrument by non-authorized personnel, a procedure to lock the keyboard is also available.

How to LOCK the front panel keys:

Press and hold the "PRG" and "O" keys.
The "O" key must be pressed after the "PRG" key.
Release both keys when the word LOCK is shown on the display.
Press the "PRG" key to confirm.
Now the front panel keys are locked.

How to UNLOCK the front panel keys:

Press and hold the "PRG" and "O" keys.
The "O" key must be pressed after the "PRG" key.
Release both keys when the word UNLOCK is shown on the display.
Press the "PRG" key to confirm.
Now the front panel keys are unlocked..

Note:

When the keyboard is locked the message LOCK appears for a while during the power-on sequence.

Main Power Connections

Use terminal 8 for the (+) input, and terminal 9 for the (-) input. The supply voltage must be 24 Vdc \pm 15%. The external power supply must have a minimum rating of 5 watts.

When no programming procedures are in progress, the display shows the weight value.
In some particular conditions the following **ERROR MESSAGES** are displayed:

O - L

The weight displayed by the instrument is more than 9 divisions over the "Live" weight value (see "NET" parameter, page 12)

The load cells input signal is lower than - 0,5 (-3,9) mV/V.

The load cells input signal is higher than +3,5 (+3,9) mV/V.

The load cell input signal is missing

The values in brackets refer to the instruments having load cells input signal range from - 3,9 to + 3,9 mV/V (optional)

Configuration Methods

The Precise Σ 400 Series Digital Transmitters can be configured by using the front panel keys to navigate through a series of menus, or by sending configuration and calibration data to the RS-232 port on COM 1 with INOVATION Σ an MS Windows based program included with the unit. INOVATION Σ simplifies the configuration and calibration procedures.

Configuration Procedures

There are two procedures available for setup of the Precise Σ 400 Series Transmitters, "Basic Configuration" or "Complete Configuration".

The "Basic Configuration" procedure allows you to change selective parameters, whereas, the "Complete Configuration" procedure allows you to change all of the parameters.

For example, if the transmitter requires calibration only, the "Basic Configuration" procedure is recommended.

The following pages provide a detailed explanation of both configuration procedures.

Basic Configuration via the Front Panel

To perform a "Basic Configuration", press and hold the "PRG" key until the display shows CAPAC. Use either the "Up" or "DOWN" keys to navigate through the eight basic configuration

Display	Sub-menu Functions
CAPAC	Total capacity of transducer/s
SENSIT	Rated output of the transducer/s
NET	Net (live) weight value
DEAD L	Dead load weight value
DSPDIV	Increment size (resolution)
SIGNAL	Transducer/s input signal (view)
CALIBR	Calibration procedure

Basic Configuration (cont'd)

To set one of the following parameters, CAPAC, SENSIT, NET, DEAD L or DSPDIV, press the "PRG" key to view the default or previously selected value for that parameter.

To change the value, press the "O" key to select a digit, then use the "Up" or "DOWN" keys to increment or decrement the value of the selected digit. When the desired value appears on the display, press the "PRG" key to store the new value. Press either the "Up" or "DOWN" keys to move to the next parameter.

The SIGNAL parameter enables you to view the actual input signal from the transducer/s. Press the "O" key to move to the next parameter.

The CALIBR parameter is used to calibrate the transmitter. The unit can be calibrated using either the data sheet or dead load procedure.

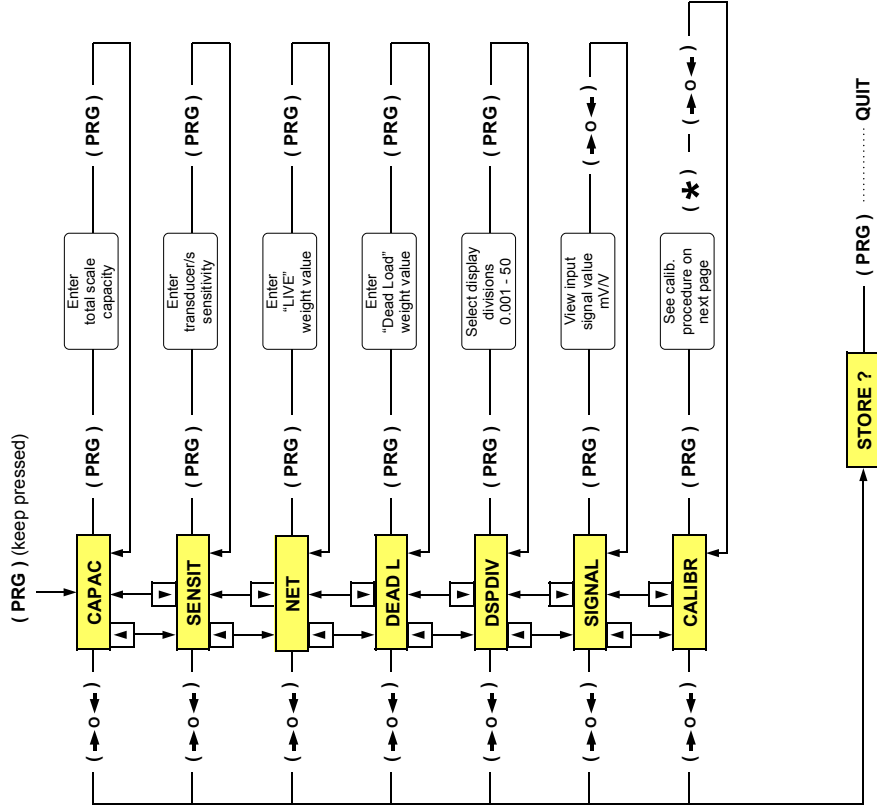
The data sheet calibration procedure allows the transmitter to be calibrated without a transducer simulator or test weights. This procedure is based on the capacity and certified, full scale mV/V output (sensitivity) of the transducer/s.

To perform a data sheet calibration, enter the total scale capacity, sensitivity, net weight, tare weight, and display resolution, then press the "O" key. The display will indicate STORE ?. press the "PRG" key to save the changes and return to the operating mode.

See page 7 and 8 for a detailed explanation of the calibration procedure using test weights.

To exit from the setup procedure, press the "O" key when any one of the following parameters are displayed CAPAC, SENSIT, ... CALIBR. The display will indicate STORE ?, press the "PRG" key to save the changes and return to the operating mode.

Basic Configuration Menu

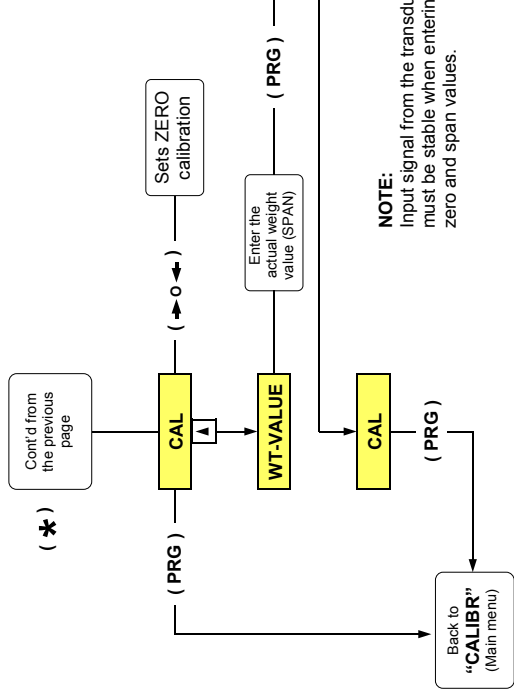


Place the unit in "Basic Configuration" mode by pressing and holding the "PRG" key until the display shows CAPAC. Use either the "UP" or "DOWN" keys to scroll through the eight basic configuration menus shown above. To set one of the following parameters, CAPAC, SENSIT, NET, DEAD L or DSPDIV, press the "PRG" key to view the default or previously selected value for that parameter. To change the value, press the "O" key to select a digit,

then use the "UP" or "DOWN" keys to increment or decrement the value of the selected digit. Press the "PRG" key to enter the new value, then press either the "UP" or "DOWN" keys to move to the next parameter. To exit the setup procedure, press the "O" key when any one of the sub-menu parameters are displayed. The display will indicate STORE ?, press the "PRG" key to save the changes and return to the operating mode.

Basic Configuration Menu (cont'd)

NOTE: In order to ensure greater stability during the calibration procedure, the digital filter increases to the maximum value automatically (value 9), therefore the weight indication updates very slowly at this stage. Once the calibration procedure has been completed, the digital filter will return to the previous value automatically.



NOTE: Input signal from the transducer/s must be stable when entering the zero and span values.

The PreciseΣ400 Series Transmitters can be calibrated via the front panel keys or with the INOVATIONΣ configuration utility.

Both methods consist of the following steps.

- + Zero calibration
- + Apply a known load (test weight)
- + Edit weight value
- + Span calibration
- + Optional linearization (See page 14)

2-point calibration via the front panel keys

To calibrate the transmitter with the front panel keys, proceed as follows:

1. With the unit in "Basic Configuration" mode and the message "CALIBR" displayed, press the "PRG" key (CAL will be blinking on the display).
2. With the system unloaded, press the "O" key to perform the ZERO calibration.
3. Apply a known load *not less than 10% of the net weight value* and press the "UP" key.

4. Enter the actual weight value using the "O" key to select each digit, then use the "UP" or "DOWN" keys to increment or decrement the value of the selected digit.

5. Press the "PRG" key to enter the setting (CAL will be blinking on the display).

6. Press the "PRG" key, (the display indicates CALIBR), press either the "UP" or "DOWN" keys to move to the next parameter.

7. If no additional parameter changes are required, press the "O" key (the display indicates STORE ?), press the "PRG" key to save the changes and return to the operating mode.

Should it be necessary to erase either of the previous calibration entries, proceed as follows:

To erase the zero calibration, press and hold the "FUN" key, and then press the "O" key. Release both keys, the previous zero calibration entry has been erased. To erase the span calibration, press and hold the "FUN" key, and then press the "SET" key. Release both keys, the previous span calibration entry has been erased.

Complete Configuration via the Front Panel

In order to perform a complete configuration, the unit must be placed in setup mode. To enter the setup mode, press and hold the "PRG" and "SET" keys on the front of the unit. The "SET" key must be pressed after the "PRG" key. Release both keys when the word CONFIG is shown on the display. The CONFIG menu is the first of six main menus used to completely configure the instrument. Use either the "UP" or "DOWN" keys to navigate through the six main menus shown below.

Display	Main Menu Functions
CONFIG	Parameters for total scale capacity, transducer sensitivity, net and tare weight values, and display divisions.
CALIBR	Zero and full scale calibration.
PARAM	Parameters for digital filtering, motion, auto zero and zero tracking
IN-OUT	Operating mode selection for outputs, and input and output test.
SERIAL	Serial output configuration.

Press the "PRG" key to move down to the sub-menu or parameter desired. Press the "PRG" key to view the default or previously selected value for that parameter.

To change a parameter, press either the "UP" or "DOWN" keys to view the choices for that parameter. When the desired selection appears on the display, press the "PRG" key to enter the selection and move to the next parameter.

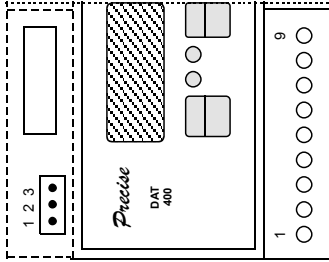
To edit numerical values, use the "O" key to select the digit, then use either the "UP" or "DOWN" keys to increment or decrement the value of the selected digit.

Configuration using INOVATIONΣ

To configure the Precise 400 Series Digital Transmitters with the INOVATIONΣ program, proceed as follows:

1. Install INOVATIONΣ on an IBM-compatible computer running Windows 95, 98, Me or XP.
2. Minimum system requirements are 8MB of extended memory and at least 5MB of available hard drive space.
3. Remove power from both units, and connect the PC's serial port to the RS-232 terminals on the transmitter. Refer to page 24 for wiring.
4. Apply power to the PC and the transmitter, then start the INOVATIONΣ program.
5. Switch the transmitter into remote mode by removing the upper left cover and moving jumper (J1) to the remote control position as shown below. The Model 400 can also be switched into remote mode by going into complete configuration and then selecting 'Remote' from the serial menu. See page 18.

Pins 1 - 2 = Remote Control
Pins 2 - 3 = Default Setting



When viewing either model from a computer, the current weight value will be displayed under the icon representing the unit being configured.

If ERROR appears under the transmitters icon, re-check all of the wiring connections, verify that the unit is in remote mode, and make sure the icon being displayed matches the address of the transmitter to be configured.

Double-clicking on the transmitters icon will bring you to the INOVATIONΣ Main Setup Screen.

Configuration using INOVATIONΣ (cont'd)

On this screen you can select the operating mode, set the address, or enter values for the two setpoints.

Click on the SETUP button, seven file folders will appear on the lower half of the screen. The first file folder labeled "Parameters" will be open.

The top section in this folder is for entering the total scale capacity, sensitivity, net weight, and tare weight values. (required parameters for performing a data sheet calibration)

The data sheet calibration procedure allows the transmitter to be calibrated without a transducer simulator or test weights. This procedure is based on the capacity and certified, full scale mV/V output (sensitivity) of the transducer/s.

To perform a data sheet calibration, enter the above values, then click on the SEND button for that group of parameters.

The next section in this file folder is used to select the display resolution. It consists of a drop down menu and a SEND button.

The PreciseΣ units allow to count by 1's up to 60,000 counts. Yet, for values greater than 10,000, the units automatically select a lower resolution to ensure greater stability. After selecting the desired resolution, press the SEND button for this parameter. Do not press any of the other SEND buttons in this folder or the unit will revert back to a default setting of x2, x5, etc.

Changes to the display resolution should only be done after the unit has already been calibrated using the data sheet or dead load procedure.

The bottom parameter selection in this file folder is labeled "Operating Mode". It enables the unit to retain the mode of operation in the event of a power loss. When the power is re-applied, the transmitter automatically returns to the mode that it was operating in prior to the power loss.

The second file folder enables you to calibrate the unit with a transducer simulator or actual weight, (recommended method of calibration).

Inside this 2nd file folder, once the zero calibration has been performed, the program asks the operator if the new zero has to modify the "Data sheet" calibration. If the operator answers "Yes", the "Dead load" value inside the first file folder will change automatically according to the new zero. If the operator answers "No", the

"Dead load" value inside the first file folder will remain set to the previous value.

The third file folder contains the parameter selections for digital filtering, zero tracking, etc.

The fourth file folder contains the parameter selections for configuring the inputs and outputs

The fifth file folder contains the parameter selections for the COM 1 serial output.

The sixth folder contains the parameter selections for the analog output. Do not enter into this section because when having the DeviceNet option card installed inside the instrument, the analog output card is missing and, of course, the analog output is not available

The seventh folder provides a means for testing the outputs

The Main Setup Screen and file folders 1 through 6 all have SEND buttons on them for downloading the various parameter changes.

When configuration and calibration has been completed, the data can be saved on a PC or floppy disk or downloaded (sent) to the transmitter. This method of configuring and calibrating is very beneficial when several transmitters with similar configurations are being set up, or when a transmitter has to be replaced.

To exit INOVATIONΣ, click on the Exit Setup icon, a "Save Changes" window will appear, click on OK. Now click on Option in the upper left corner of the screen, from the drop down menu select EXIT, this will return you to the Configuration Utility Screen, click on QUIT.

Figure 2 shows an example of one of the INOVATIONΣ configuration screens.

Figure 2

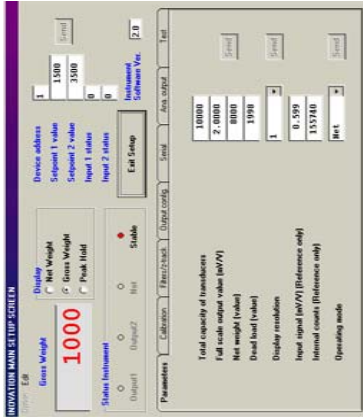
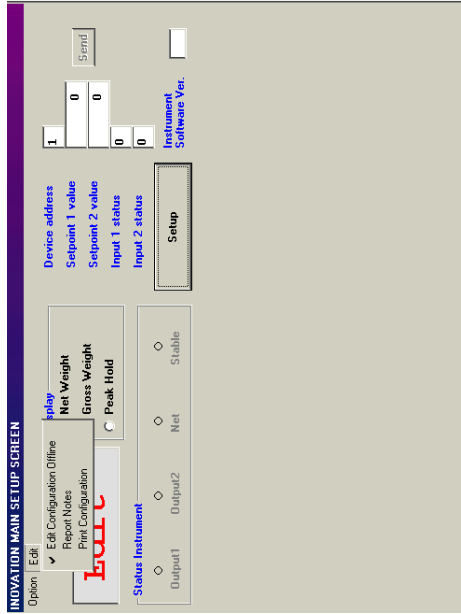


Figure 2.1



The INOVATIONΣ software also allows the operator to create new configurations, save new files and open existing files **without having any instrument connected to the computer.**

Thanks to this feature, the download of a given configuration to the instrument can be performed at any time.

To perform the above mentioned procedure click on the "Edit" menu at the left end upper corner (See figure 2.1), then enable the function "Edit Configuration Offline".

The message "Edit" will appear on the display, showing this particular condition.

Another useful function concern the possibility to print out a report in which all the parameters of a given configuration are included.

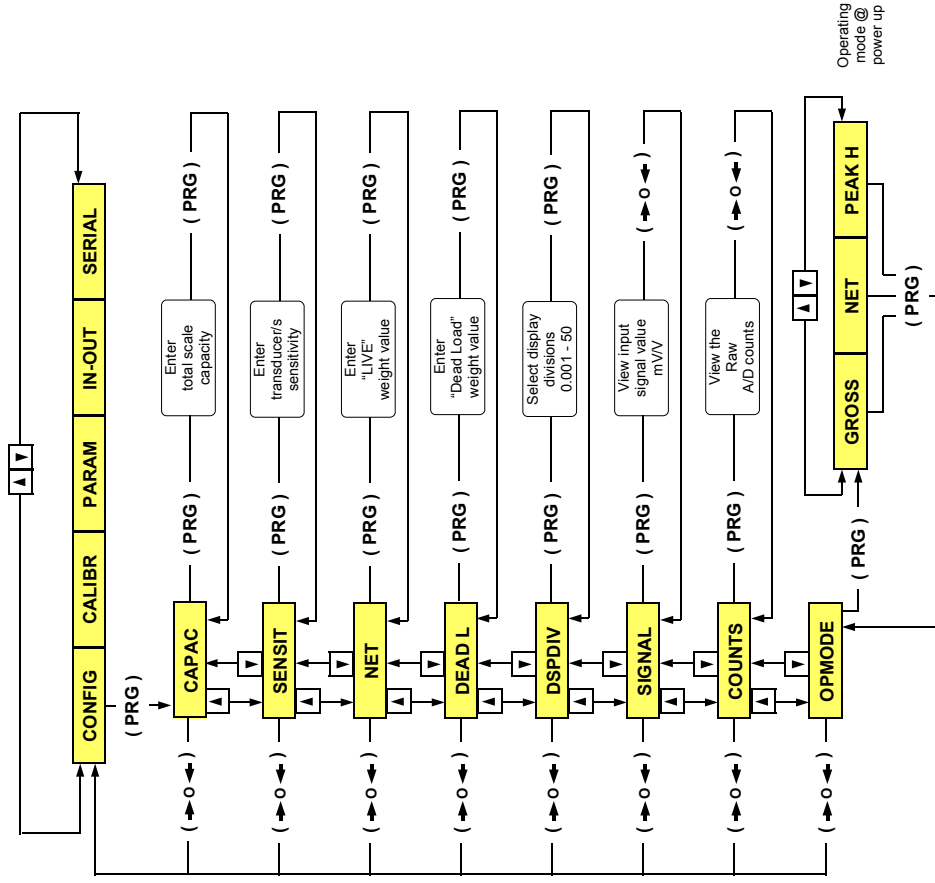
The "Print" command can be performed by clicking on "Print Configuration".

Besides, the command "Report Notes" allows the operator to include a heading in the report, in order to identify the plant, the customer name or any other useful information.

An example of a printed report is given on the right side of this page:

PRINT CONFIGURATION	
Date 13/10/2002 Test Procedure for DAT instruments	
Status Instrument	
Device address	2
Setpoint 1 value	1500
Setpoint 2 value	3500
Input 1 status	0
Input 2 status	0
Instrument software version	2.3
Parameters	
Total capacity of transducers	10000
Full scale output value (mV/V)	20000
Net weight (value)	8000
Dead load (value)	1500
Display resolution	1
Input signal	0.599
Internal counts (Reference only)	155729
Operating mode	Net
Filters / z-track	
Digital filter value (0 to 9; 0 = no filter; 9 = max filter; default 5)	5
Motion band value (0 to 4; 0 = minimum; 4 = maximum; default 2)	1
Auto zero range setting at power up (0 to 10.0% of net weight; 0 = disable)	0.0
Zero tracking (0 to 4; default 2)	2
Output config.	
Operating mode	Net
Contact status below setpoint value	N. Open
Positive / Negative weight comparison	Positive
Immediate activation / activation after stabilization	Immediate
Hysteresis (default 2)	2
Setpoint activation time length (in 1/10 sec.; (0 = disable)	0
Time delay for activating setpoint (in 1/10 sec.; (0 = disable)	0
Output config.	
Operating mode	Gross
Contact status below setpoint value	N. Closed
Positive / Negative weight comparison	Positive
Immediate activation / activation after stabilization	Immediate
Hysteresis (default 2)	50
Setpoint activation time length (in 1/10 sec.; (0 = disable)	0
Time delay for activating setpoint (in 1/10 sec.; (0 = disable)	0
Serial	
Baud Rate (default 9600)	9600
Serial port mode (default Continuous transmission)	Slave
Serial address (ID Code) (from 01 to 32)	2
Response delay (Demand or Modbus mode) (in 1/100 sec. Max 1 sec.)	25
Anal. Output	
Full scale value (default = Net weight value)	
Analog output source (Net Gross Peak H)	
Analog output selection	
No load zero input value	

Complete Configuration Menu



Place the unit in complete configuration mode by pressing and holding the "PRG" and SET" keys on the front of the unit. The "SET" key must be pressed after the "PRG" key. Release both keys when CONFIG is displayed.

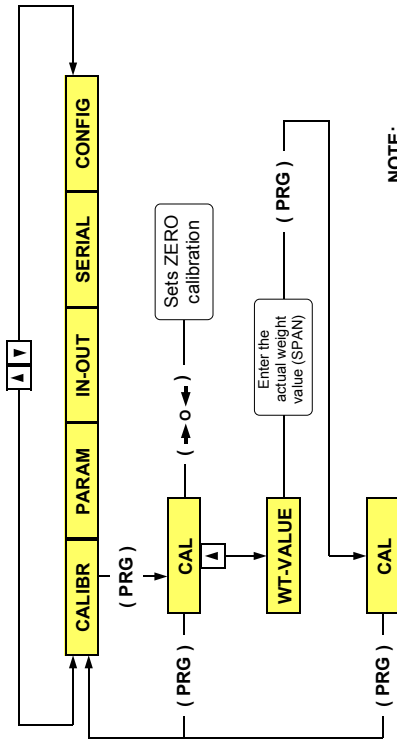
Press the "PRG" key to enter the sub-menu, then use either the "UP" or "DOWN" keys to select one of the sub-menu parameters. Press the "PRG" key to view the default or previously selected value for that parameter.

To change the value, press the "O" key to select a digit, then use the "UP" or "DOWN" keys to increment or decrement the value of the selected digit. Press the "PRG" key to enter the new value, then press either the "UP" or "DOWN" keys to move to the next sub-menu parameter or press the "O" key to return to the main menu.

To exit the configuration procedure, return to the main menu and press the "O" key, (the display will indicate STORE ?), press the "PRG" key to save the changes and return to the operating mode.

Complete Configuration Menu (cont'd)

NOTE: In order to ensure greater stability during the calibration procedure, the digital filter increases to the maximum value automatically (value 9), therefore the weight indication updates very slowly at this stage. Once the calibration procedure has been completed, the digital filter will return to the previous value automatically.



NOTE:
Input signal from the transducer/s must be stable when entering the zero and span values.

NOTE: Prior to calibration, the transmitter must be configured, thus giving it a set of operating parameters.

The unit can be calibrated using the 2-point method or the optional multi-point (linearity compensation) method. See page 14 for a detailed description of the multi-point calibration procedure.

2-Point calibration via the front panel keys

To calibrate the transmitter using the front panel keys, proceed as follows:

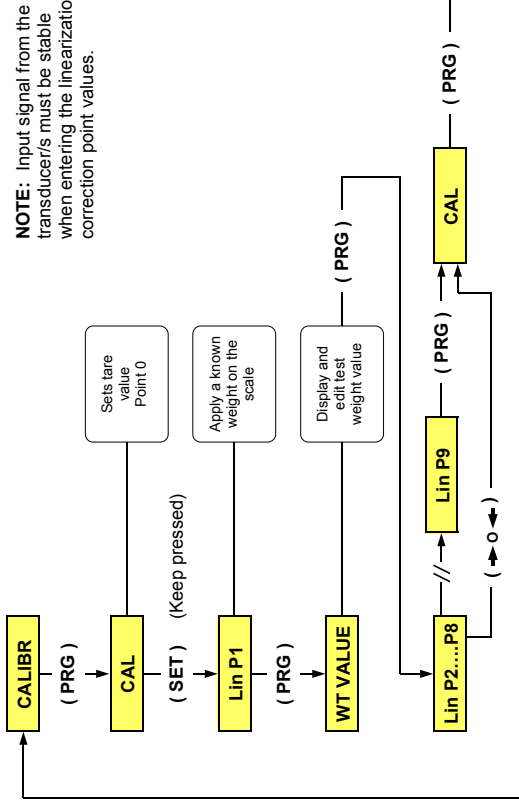
1. With the unit in "Complete Configuration" mode, press either the "UP" or "DOWN" keys until CALIBR is shown on the display.
2. Press the "PRG" key (CAL will be blinking on the display).
3. With the system unloaded, press the "O" key.
4. Apply a known weight *not less than 10% of the net weight value* and press the "UP" key.

Should it be necessary to erase either of the previous calibration entries, proceed as follows:

To erase the zero calibration, press and hold the "FUN" key, and then press the "O" key. Release both keys, the previous zero calibration entry has been erased. To erase the span calibration, press and hold the "FUN" key, and then press the "SET" key. Release both keys, the previous span calibration entry has been erased.

Basic Configuration Menu (cont'd)

NOTE: Input signal from the transducer/s must be stable when entering the linearization correction point values.



The Model 400 features a 10-point linearization option (available only with the front panel keys, not with INOVATIONΣ.). Any number of points up to 10 may be used, however, the last point *must always be* the full scale value of the weighing system.

Example: A one point linearization correction would require a total of two points, one point within the range, and one point for full scale.

Prior to performing the linearization correction, the unit must have already been calibrated using the 2-point method. The unit must be in CALIBR mode, and you should have known weights available equal to the points being set.

Multi-point Calibration via Front Panel Keys

1. With the unit in either "Basic or Complete Configuration" mode, press the "PRG" key (CAL will be blinking on the display).
2. Press and hold the "SET" key until Lin P1 is blinking on the display.
3. Apply a known weight for the first linearization point, and press the "PRG" key.
4. Enter the actual weight value using the "O" key to select each digit, then use the "UP" and "DOWN" keys to increment or decrement the value of the selected digit.
5. Press the "PRG" key. The unit will increment to the next linearization point (Lin P2).
6. Repeat steps 3 through 5 for additional points.
7. If all 10 points will be linearized, follow the 1st procedure. For linearization correction using less than 10 points, follow the 2nd procedure.

1st Procedure (10-point linearization)

7a. Enter the weight value for linearization point Lin P9, and press the "PRG" key (CAL will be blinking on the display). Press the "PRG" key again, (the display indicates CALIBR).

7b. Press the "O" key (the display will indicate STORE ?), press the "PRG" to save the changes and return to the operating mode.

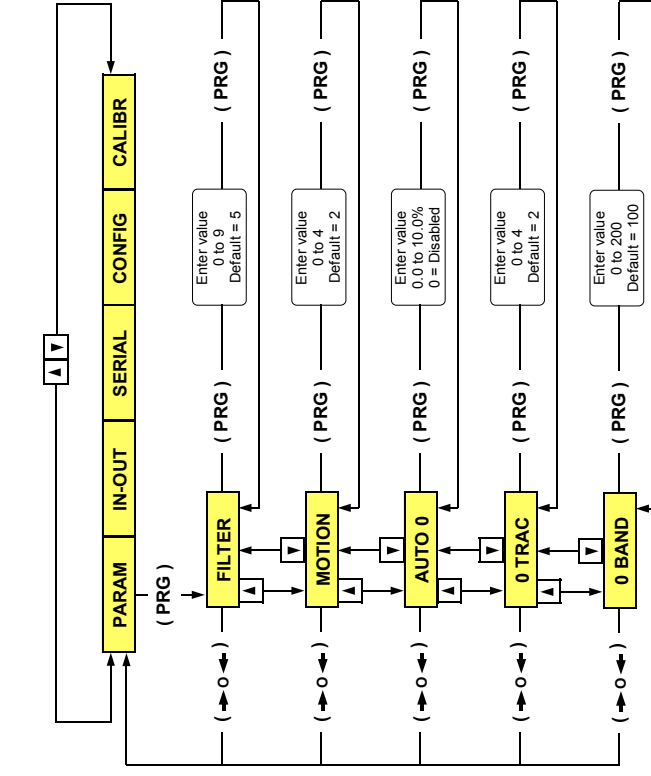
2nd Procedure (less than 10-point linearization)

7a. The last linearization point *must be* the full scale value. Press the "O" key, (CAL will be blinking on the display).

7b. Press the "PRG" key (the display will show CALIBR). Press the "O" key (the display will indicate STORE ?).

7c. Press the "PRG" key to save the changes and return to the operating mode.

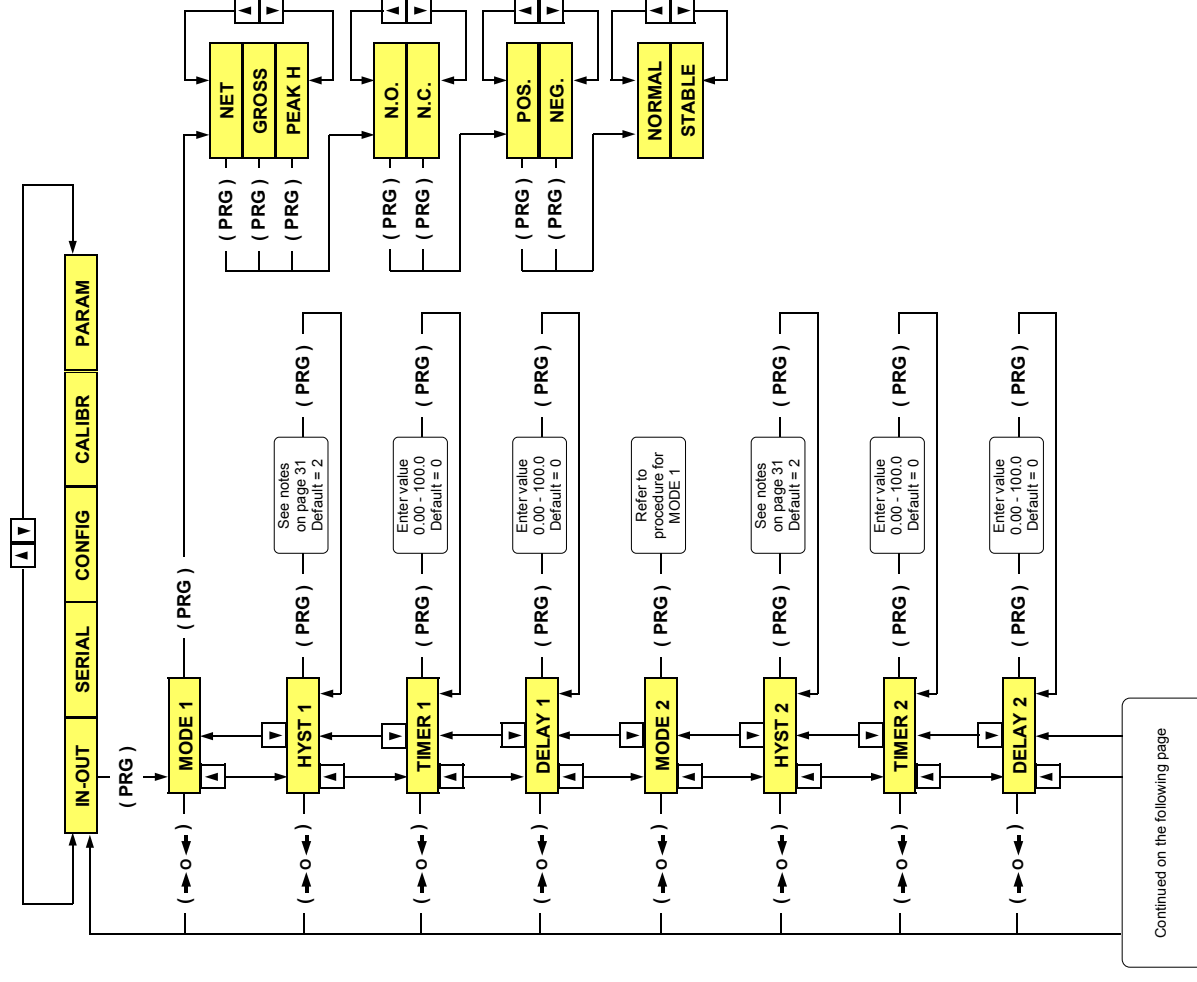
Complete Configuration Menu (cont'd)



1. With the unit in "Complete Configuration" mode, press either the "UP" or "DOWN" keys until PARAM is shown on the display.
2. Press the "PRG" key to enter the sub-menu, then use either the "UP" or "DOWN" keys to select one of the sub-menu parameters.
3. Press the "PRG" key to view the default or previously selected value for that parameter.
4. To change the value, press the "O" key to select a digit, then use the "UP" or "DOWN" keys to increment or decrement the value of the selected digit.

See Table 2 on page 29 for a detailed explanation of the "PARAM" parameter selections

Complete Configuration Menu (cont'd)



Continued on the following page

Complete Configuration Menu (cont'd)

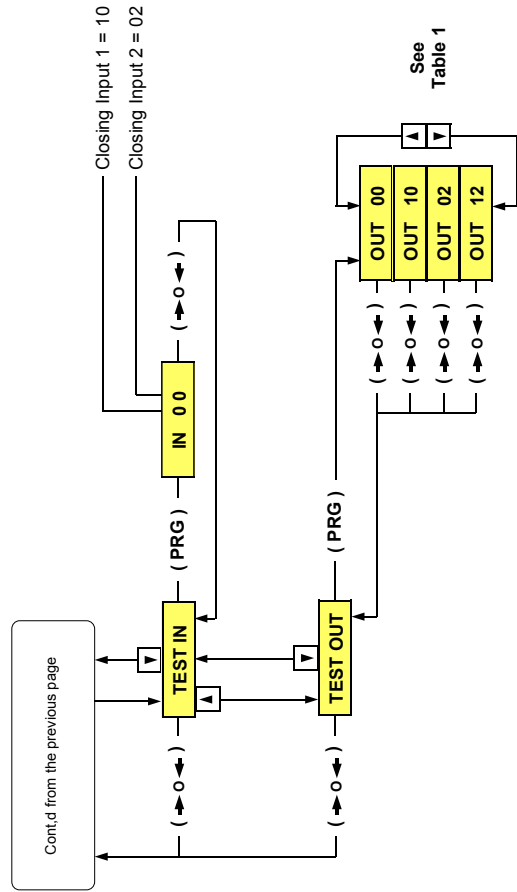
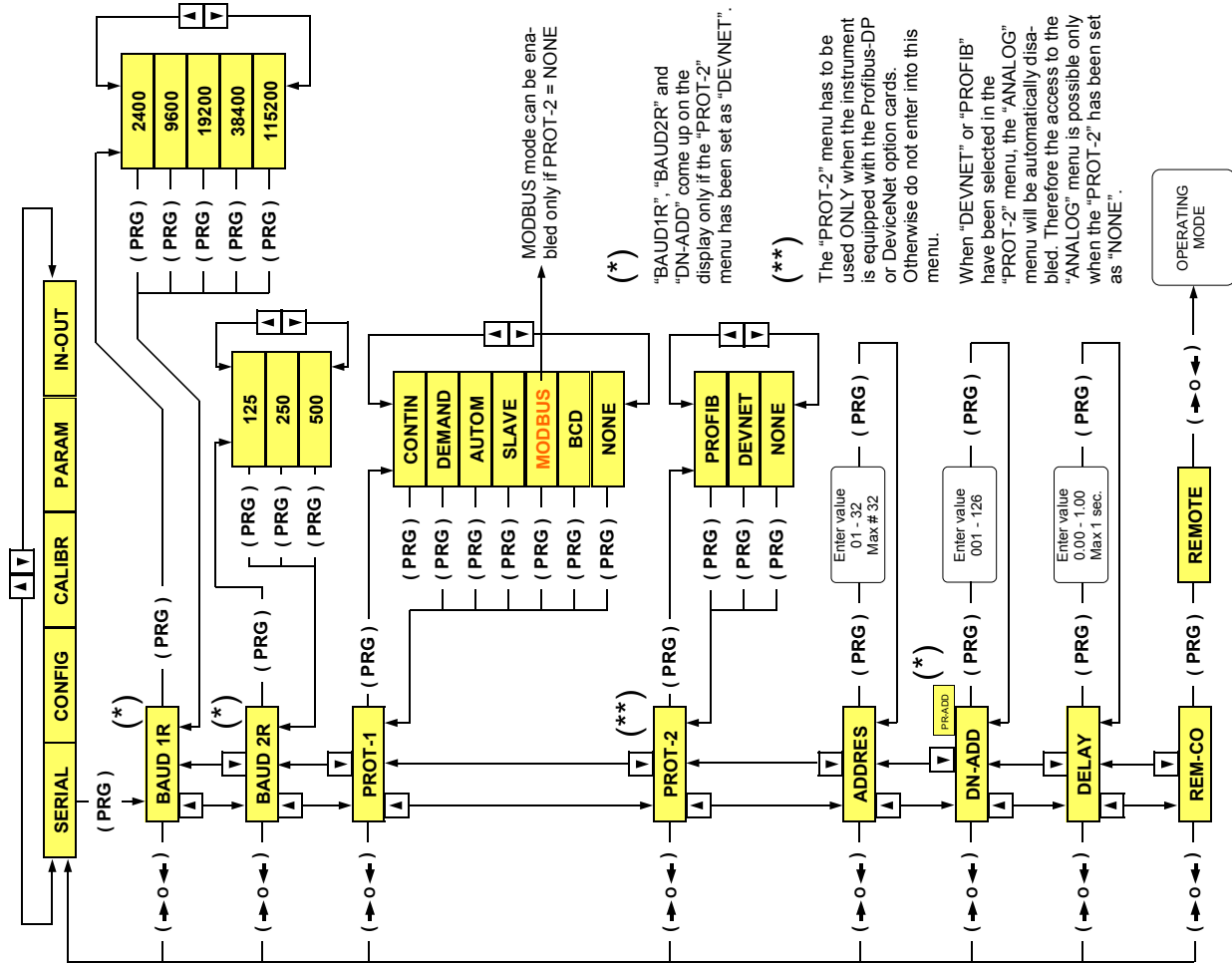


Table 1

Display	OUTPUT 1 (status)	OUTPUT 2 (status)
OUT 00	OFF	OFF
OUT 10	ON	OFF
OUT 02	OFF	ON
OUT 12	ON	ON

See Table 6 on page 31 for a detailed explanation of the "IN - OUT" parameter selections

Complete Configuration Menu (cont'd)



See Tables 3 through 5 for a detailed explanation of the "SERIAL" parameter selections

COM 1 Port

Serial Communication

Baud Rates

2400, 9600, 19200, 38400, and 115200

Data Formats

All serial characters are in ASCII format, and consist of the following.

1 Start Bit, 8 Data Bits, 1 Stop Bit, No Parity

Transmission of the serial data can be initiated in several ways as described below.

Automatic mode

The "Automatic" mode is used to interface with printers or other data acquisition devices. The serial data is transmitted automatically, *upon stabilization* whenever the weight value has increased or decreased more than 20 divisions.

This function is not performable when the "MOTION" parameter is set to 0 (weight stability check disabled).

Continuous mode

The "Continuous" mode is used to interface with computers, remote displays, or other types of devices that require constant data updating.

Demand mode

The "Demand" mode is used to interface with printers and requires a manual print command from the front panel keys (Model 400) or a remote contact closure to initiate the output.

In the above modes, the transmitter sends serial data using the format shown below:

STX	<status>	<net weight>	<gross weight>	<peak value>	ETX	<chksum>	EOT
-----	----------	--------------	----------------	--------------	-----	----------	-----

STX (start of text) = 02h ETX (end of text) = 03h EOT (end of transmission) = 04h

<status> = 1 ASCII character consisting of the following:

 " S " = Stable
 " M " = Motion
 " O " = Overload
 " E " = Error

<net weight> = 6 ASCII characters
<gross weight > = 6 ASCII characters
<peak value> = 6 ASCII characters
<checksum> = 2 ASCII characters (STX & ETX are not included in the checksum)

NOTE: The brackets "<" ">" are not sent, they are only shown for clarification.

The checksum control value is obtained by performing the XOR operation.

It is expressed with 2 Hexadecimal digits. Example: 25 = 1D

The result of the above calculation equals 1 character, which can be a numerical value of 0 to 9 or A to F (Hexadecimal)

Serial Communication (cont'd)

Slave mode

The slave mode is used for interfacing with distributed control systems (DCS) or programmable logic controllers (PLC). This mode requires a data request from the master to initiate the output.

In this mode the host sends serial data to the transmitter using the formats shown below:

<addr>	"N"	EOT
--------	-----	-----

After receiving the request, the transmitter responds with the following data string.

<addr>	"N"	<status>	<net weight>	<gross weight>	<peak value>	ETX	<chksum>	EOT
--------	-----	----------	--------------	----------------	--------------	-----	----------	-----

In case of an error, the transmitter will respond with the following data string.

<addr>	NAK	EOT
--------	-----	-----

<addr> serial address + 80h Example: address 1 would be 1 + 80h = 81h
ETX (end of text) = 03h EOT (end of transmission) = 04h

Character strings

<status> = 1 ASCII character consisting of the following:

 " S " = Stable
 " M " = Motion
 " O " = Overload
 " E " = Error

<net weight> = 6 ASCII characters
<gross weight > = 6 ASCII characters
<peak value> = 6 ASCII characters
<checksum> = 2 ASCII characters (Addr & ETX are not included in the checksum)

NOTE: The brackets "<" ">" are not sent, they are only shown for clarification.

The checksum control value is obtained by performing the XOR operation.

It is expressed with 2 Hexadecimal digits. Example: 25 = 1D

The result of the above calculation equals 1 character, which can be a numerical value of 0 to 9 or A to F (Hexadecimal)

Programming the set-points

Command from the host

<addr>	"S"	<s1>	<s2>	ETX	<chksum>	EOT
--------	-----	------	------	-----	----------	-----

<s1> = 6 ASCII characters for set-point 1
<s2> = 6 ASCII characters for set-point 2

The transmitter responds with the following data string:

<addr>	ACK	EOT
--------	-----	-----

In case of an error, the transmitter will respond with the following data string.

<addr>	NAK	EOT
--------	-----	-----

The programmed values are stored in RAM, however, they are not retained if the power is removed. There is no limit on the number of times that these commands can be performed.

Store set-point values in Eeprom

Command from the host

<addr>	"M"	EOT
--------	-----	-----

The transmitter responds with the following data string:

<addr>	"M"	EOT
--------	-----	-----

In case of an error, the transmitter will respond with the following data string.

<addr>	NAK	EOT
--------	-----	-----

This command is used to store the programmed set-point values in Eeprom.
This command can be performed up to 100,000 times.

Request set-point values

Command from the host

<addr>	"R"	EOT
--------	-----	-----

The transmitter responds with the following data string:

<addr>	"R"	<s1>	<s2>	ETX	<checksum>	EOT
--------	-----	------	------	-----	------------	-----

In case of an error, the transmitter will respond with the following data string.

<addr>	NAK	EOT
--------	-----	-----

"Net mode" / "Gross mode" switch command

This command performs the same function of the "FUN" key.

Switch to Gross weight mode

Command from the host

<addr>	"C"	"L"	EOT
--------	-----	-----	-----

The transmitter responds with the following data string:

<addr>	"C"	"L"	ACK	EOT
--------	-----	-----	-----	-----

In case of an error, the transmitter will respond with the following data string.

<addr>	NAK	EOT
--------	-----	-----

Switch to Net weight mode

Command from the host

<addr>	"C"	"N"	EOT
--------	-----	-----	-----

The transmitter responds with the following data string:

<addr>	"C"	"N"	ACK	EOT
--------	-----	-----	-----	-----

In case of an error, the transmitter will respond with the following data string.

<addr>	NAK	EOT
--------	-----	-----

Zero / Tare / Peak reset command

This command performs the same function of the "0" key and/or logic input (1).
It's used to zero the unit when in Gross mode, tare the unit when in Net mode, and reset the value to zero when operating in Peak Hold mode.

Command from the host

<addr>	"A"	"A"	EOT
--------	-----	-----	-----

The transmitter responds with the following data string:

<addr>	"A"	"A"	ACK	EOT
--------	-----	-----	-----	-----

In case of an error, the transmitter will respond with the following data string.

<addr>	NAK	EOT
--------	-----	-----

Modbus mode

Even though the Modbus RTU and the DeviceNet protocols are managed by two different serial ports (COM 1 and COM 2), **the two protocols can not be used at the same time**. This means that the Modbus RTU protocol on COM 1 port is available only when the protocol on COM 2 port is set to "NONE".

The other ASCII protocols available on COM 1 port can be used even when the DeviceNet protocol is used on the COM 2 port.

Since this manual has been released to give information on the DeviceNet protocol, the Modbus protocol will not be explained here.

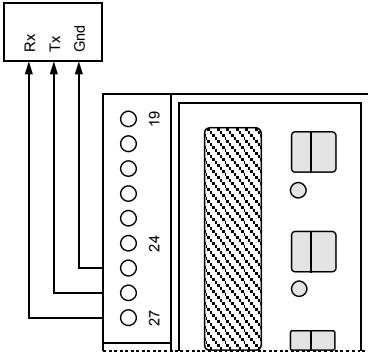
THE SERIAL COMMUNICATION ON THE COM2 PORT

DeviceNet is the only protocol managed by this communication port

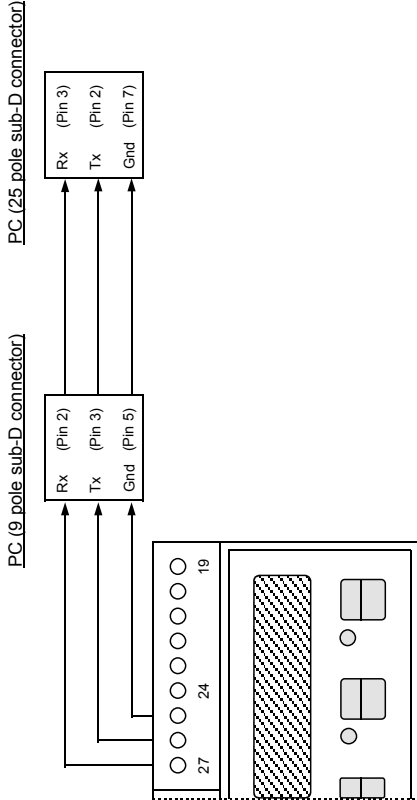
Serial Output Wiring Connections on COM 1 port

RS-232 serial connections to a computer, remote serial display or other data acquisition device.
See Figure 3.

Figure 3



“INOVATION” Software: RS232 wiring to PC



DeviceNet Input Data Area

Variable	Bytes mapping
Set point 1 Permanent	0 - 1
Set point 2 Permanent	2 - 3
Gross weight value (MSB)	4 - 5
Gross weight value (LSB)	6 - 7
Net weight value (MSB)	8 - 9
Net weight value (LSB)	10 - 11
Input status byte (*)	12 - 13

DeviceNet Output Data Area

Variable	Bytes mapping
Set point 1 temporary (see NOTE)	0 - 1
Set point 2 temporary (see NOTE)	2 - 3
Command register (**)	4 - 5
Set point 1 Permanent (see NOTE)	6 - 7
Set point 2 Permanent (see NOTE)	8 - 9

(*) List of the bits in the “Input status byte”

Bit	Description	Bit's meaning	
		0	1
12.0	Net weight polarity	+	-
12.1	Gross weight polarity	+	-
12.2	Stable weight	NO	YES
12.3	Millivolt polarity	+	-
12.4	Underload condition	NO	YES
12.5	Overload condition	NO	YES
12.6	Off range condition	NO	YES
12.7	Preset tare condition	NO	YES
13.0	Input 1	De-activated	Activated
13.1	Input 2	De-activated	Activated

E.g.
If the value received through the **byte nr. 12** is **85h**, the conversion into binary gives the sequence of bits **10000101**. In this sequence of bits the digit at the right hand side matches with the **1st** bit of the byte nr. 12 (**12.0**, Net weight polarity), therefore the values given in this example are equivalent to:

Net weight polarity = **1** = negative
Gross weight polarity = **0** = positive
Weight stability condition = **1** = yes
Millivolt polarity = **0** = positive
Underload condition = **0** = no
Overload condition = **0** = no
Off range condition = **0** = no
Preset tare condition = **1** = no

If the value received through the **byte nr. 13** is **03h**, the conversion into binary gives the sequence of bits **00000011**. In this sequence of bits the digit at the right hand side matches with the **1st** bit of the byte nr. 13 (**13.0**, Input 1), therefore the values given in this are equivalent to:

Input 1 = **1** = Activated
Input 2 = **1** = Activated

The bits 13.2 to 13.7 are not relevant

(**) List of the functions “Command register”

Function codes	Description
0001	Semi-automatic zero command
0002	Auto tare command
0003	Peak reset command
0004	Force Net weight visualization
0005	Force Gross weight visualization

NOTE:

The setting of the Set-point values via DeviceNet is performable only when the front panel keys of the instrument have been locked (see “Enabling/Disabling front panel keys” procedure on page 5 of the Installation & Operating manual). Otherwise the Set-point values setting is performable via the front panel only.

12.1) THE "EDS" FILE *(supplied on a floppy disk)*

```
[File]
DescText      = "HMS AnyBus-IC DEV";
CreateDate    = 11-22-2001;
CreateTime    = 07:23:00;
ModDate       = 04-03-2003;
ModTime       = 14:45:00;
Revision      = 1.1;

[Device]
VendCode      = 90;
VendName      = "HMS Networks";
ProdType      = 12;
ProdTypeStr   = "Communications Adapter";
ProdCode      = 61;
MajRev        = 1;
MinRev        = 13;
ProdName      = "AnyBus-IC DeviceNet";
Catalog       = "AnyBus-IC DeviceNet";

[IO_Info]
Default       = 0x0001;    $ Default IO Connection = Poll

PollInfo      = 0x000F,    $ Compatible IO type mask = All connections
               1,          $ Input1
               1;          $ Output1

StrobeInfo    = 0x000F,    $ Compatible IO type mask = All connections
               1,          $ Input1
               1;          $ Output1

COSInfo       = 0x000F,    $ Compatible IO type mask = All connections
               1,          $ Input1
               1;          $ Output1

CyclicInfo    = 0x000F,    $ Compatible IO type mask = All connections
               1,          $ Input1
               1;          $ Output1

Input1        = 1,        $ 1 byte
               0,        $ All bits are significant
               0x000F,    $ Compatible IO type mask = All connections
               "ABIC Produce", $ Name
               6,        $ Path size
               "20 04 24 64 30 03", $ Assembly object, Inst 100, Attr 3
               "Data produced by the AnyBus-IC";
```

```
Output1       = 1,        $ 1 byte
               0,        $ All bits are significant
               0x000F,    $ Compatible IO type mask = All connections
               "ABIC Consume", $ Name
               6,        $ Path size
               "20 04 24 96 30 03", $ Assembly object, Inst 150, Attr 3
               "Data consumed by the AnyBus-IC";

[ParamClass]
MaxInst       = 0;        $ Max Instances - total # configuration parameters
Descriptor    = 0x00;    $ Parameter Class Descriptor - No parameters
CfgAssembly   = 0x00;    $ The config assembly is not supported.
```

The PLC master has to be configured to manage **32 bytes** as **input** and **48 bytes** as **output**

12.2) ABOUT THE DeviceNet MODULE INSIDE THE INSTRUMENT (AnyBus-IC DeviceNet)

The AnyBus-IC DeviceNet integrates all analog and digital functionality required to communicate on a DeviceNet network into a single chip. Being a member of the AnyBus-IC family, it can be used with intelligent as well as non-intelligent applications, using a serial communication interface, and/or using external shift-registers to form digital inputs and outputs.

Features

- Identity Object Customization
This makes it possible for a configuration tool to identify the module as a special implementation and not as a general AnyBus-IC module.

- I/O data
It is possible to configure the in / out data size from the application. The module supports up to 48 bytes in and 48 bytes out data. Supported data types:

- + Polled I/O data
- + COS/Cyclic I/O data
- + Bitstrobe I/O data

- Application Parameters
Application specific parameters can be created by the application during startup.

- Acyclic Data and Parameter Data Mapping
Application Parameters can be accessed from the fieldbus by mapping them to a Vendor Specific DeviceNet Object.

Compatible Products

This product is a member of the AnyBus concept of interchangeable fieldbus modules. This makes it fully interchangeable with any supported AnyBus-IC fieldbus system. Standardization of mechanical, electrical and software interfaces ensures that the different AnyBus-IC models are fully interchangeable. This also means that the same PCB layout can be used for the different fieldbus systems.

EDS-File

Each device in a DeviceNet network is associated with an EDS-file, containing all necessary information about the device. This file is used by the network configuration utility during network configuration. The EDS-file is supplied on a floppy disk together with the device

Note: If the information in the Identity Object has been changed, the above EDS file cannot be used.

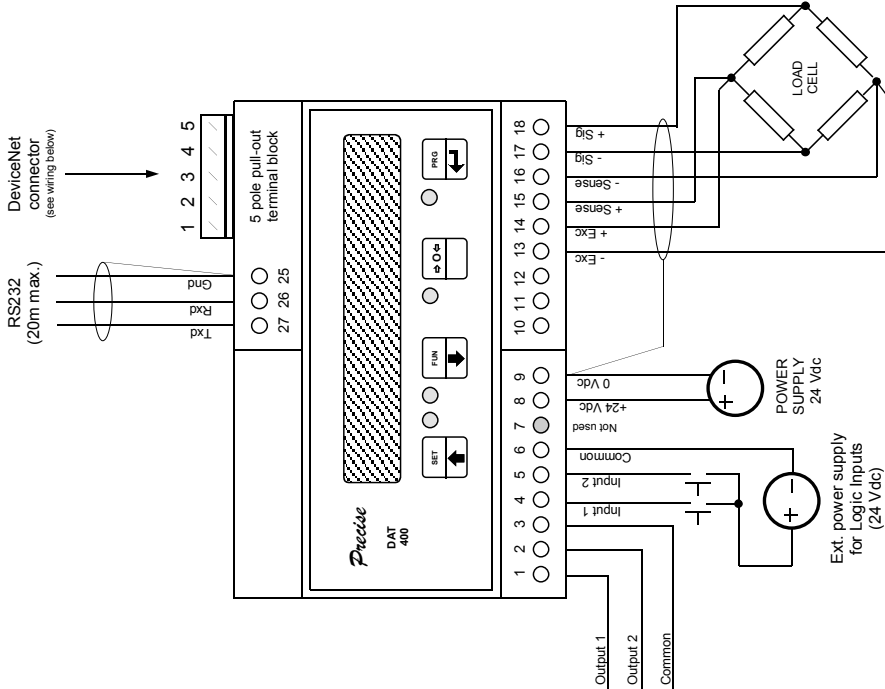
DeviceNet connector

The recommended connector for DeviceNet is a 5 pole pull-out terminal block. See pinout on page 28

Implemented DeviceNet objects

Refer to the "ABIC-APPENDIX-DEV Rev. 1.10", chapter 5 (pages 5-1 to 5-8)

DAT 400 DeviceNet wiring



Pin	Signal
1	V-
2	CAN_L
3	SHIELD
4	CAN_H
5	V+

DeviceNet connector

Sub-menu parameter selections

Table 2 "PARAM" Menu

PARAMETERS	SELECTIONS	DESCRIPTION	VALUES
FILTER (See notes below)	0 to 9 (Default = 5)	Digital filtering value	0 = no filtering 9 = maximum filtering
MOTION	0 to 4 (Default = 2)	Weight stabilization	0 = Weight always stable 1 = slow stabilization 4 = fast stabilization
AUTO 0	0.0 to 10.0% (of net weight value)	Auto zero range @ power up.	0 = function disabled
0 TRAC	0 to 4 (Default = 2)	Zero tracking range	0 = function disabled
0 BAND (See notes below)	0 to 200 divisions (Default = 100)	"Zero" key operating range	0 = function disabled

Digital filtering affects the update rate and speed of the unit. **0 BAND:**
this parameter defines the operating range of the "Zero" key (and Input 1), used to zero the unit in Gross mode.

Filter setting = 0
Update rate = 25 Hz
Filter setting = 1
Update rate = 10 Hz
Filter setting = 2
Update rate = 5 Hz
Filter setting = 3
Update rate = 2.5 Hz
Filter setting = 4
Update rate = 1.5 Hz
Filter setting = 5
Update rate = 1 Hz
Filter setting = 6
Update rate = 0.7 Hz
Filter setting = 7
Update rate = 0.4 Hz
Filter setting = 8
Update rate = 0.2 Hz
Filter setting = 9
Update rate = 0.1 Hz

Table 3 "SERIAL" Menu

PARAMETERS	SELECTIONS	DESCRIPTION
BAUD 1R	2400, 9600, 19200, 38400, 115200	COM1 Baud rate selection Standard baud rate: 9600
BAUD 2R	125, 250, 500	COM2 Baud rate selection (for DeviceNet only)
PROT-1	NONE CONTIN DEMAND AUTOM SLAVE MODBUS BCD	COM1 Serial port transmission mode selection Standard transmission mode: Continuous
PROT-2	PROFIB DEVNET NONE	COM2 Serial port transmission mode selection
ADDRES	01 to 32	COM1 Identification address, selectable from 1 to 32
DN ADD	001 to 126	DeviceNet node address
DELAY	0.00 to 1.00	Delay in responding to a data request from the host in "Demand" or "MODBUS" modes (COM1). Time unit: 1/100 second (maximum 1 second)
REM-CO	REMOTE	Enables communication with "INOVATION" without re-positioning jumper (J1) as described on page 9.

Sub-menu parameter selections (cont'd)

Continuous transmission:

The transmission speed depends on the digital filter setting and the baud rate value selected.
See Table 4 below for additional information.

Table 4

BAUD RATE						
	2400	9600	19,200	38,400	115,200	
D I G I T A L F I L T E R	0	6 Hz	25 Hz	50 Hz	50 Hz	50 Hz
	1	6 Hz	25 Hz	50 Hz	50 Hz	50 Hz
	2	6 Hz	25 Hz	50 Hz	50 Hz	50 Hz
	3	6 Hz	25 Hz	25 Hz	25 Hz	25 Hz
	4	6 Hz	25 Hz	25 Hz	25 Hz	25 Hz
	5	6 Hz	12 Hz	12 Hz	12 Hz	12 Hz
	6	6 Hz	12 Hz	12 Hz	12 Hz	12 Hz
	7	6 Hz	12 Hz	12 Hz	12 Hz	12 Hz
	8	6 Hz	6 Hz	6 Hz	6 Hz	6 Hz
	9	6 Hz	6 Hz	6 Hz	6 Hz	6 Hz

Driver for the optional BCD Board:

The transmission speed depends on the digital filter setting and the baud rate value selected.
See Table 5 below for additional information.

Table 5

BAUD RATE						
	2400	9600				
D I G I T A L F I L T E R	0	12 Hz	50 Hz			
	1	12 Hz	50 Hz			
	2	12 Hz	50 Hz			
	3	12 Hz	25 Hz			
	4	12 Hz	25 Hz			
	5	12 Hz	12 Hz			
	6	12 Hz	12 Hz			
	7	12 Hz	12 Hz			
	8	6 Hz	6 Hz			
	9	6 Hz	6 Hz			

Sub-menu parameter selections (cont'd)

Table 6

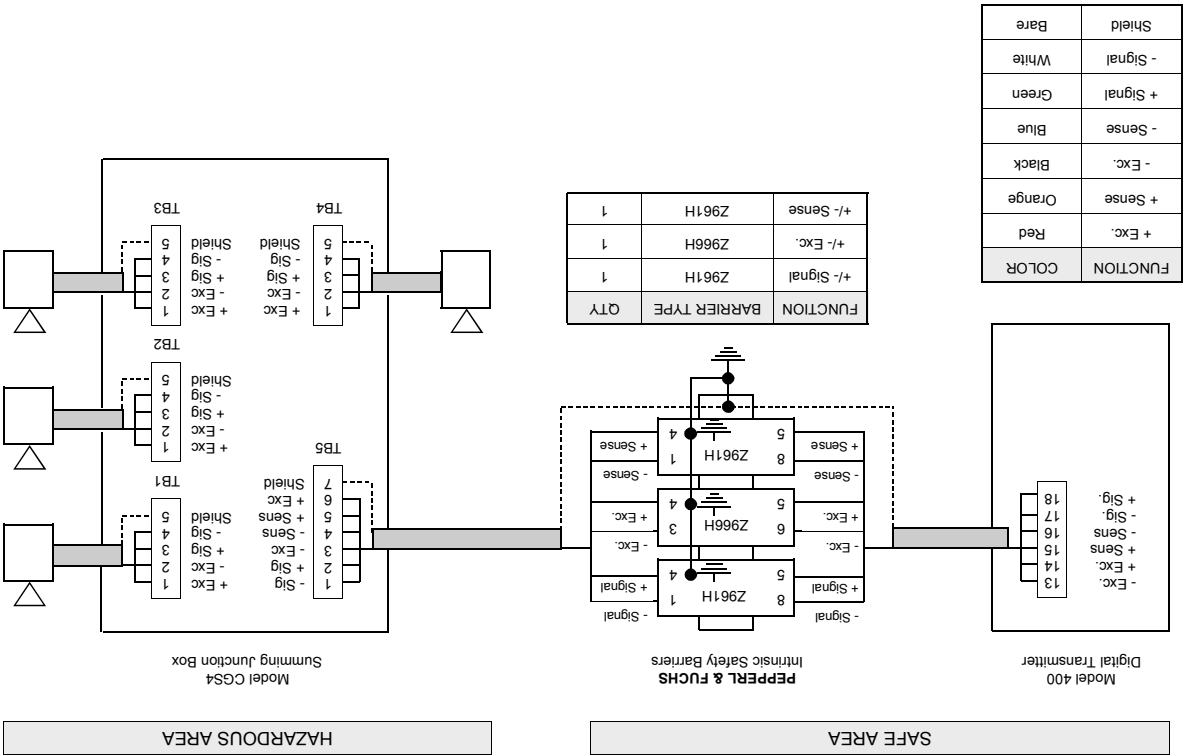
"IN - OUT" MENU		
PARAMETERS	SELECTIONS	DESCRIPTION
MODE 1	GROSS NET PEAK H	Operating mode selection for output number 1.
	N.O N.C	Contact status below the setpoint value
	POS. NEG.	Comparison with positive or negative weight values
	NORMAL STABLE	Output enabled <i>only after</i> the weight reading has stabilized.
HYST - 1 (See notes below)	(Default = 2)	Hysteresis setting, used to eliminate chattering of the relay @ coincidence point.
TIMER 1	0.0 to 10.0 (0 = disabled)	The output is disabled after the time period has expired. (1/10 second increments)
DELAY 1	0.0 to 10.0 (0 = disabled)	Time delay before the output is enabled. (1/10 second increments)
Same parameter selections as above for output 2		
TEST IN	See page 17	Test procedure for inputs
TEST OUT		Test procedure for outputs

NOTES:

1. The hysteresis setting *must* be less than it's respective setpoint value. Entering a hysteresis setting greater than the setpoint value will automatically be replaced with a default setting of (2) counts.
2. Hysteresis settings of within 10 counts of their respective setpoint values are possible, however, much smaller values are normally sufficient.
3. A large hysteresis setting (4,990 counts) could be used as follows:

Setpoint 1 is used to fill a vessel with 5,000 lbs. of product, and setpoint 2 will be used as a high weight alarm. When the weight in the vessel reaches 5,000 lbs., relay # 1 de-energizes stopping the flow, feed, etc. The product is drawn from the vessel as required, when the weight in the vessel reaches 10 lbs., setpoint # 1's relay re-energizes and automatically refills the vessel to 5,000 lbs.

Intrinsic Safety Barriers



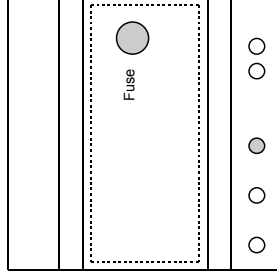
Options

Predive™ 24 Volt Power Supply

Installation

- ✦ Make sure the installation complies with local regulations and electrical codes.
- ✦ Connect AC voltage to the terminals marked "L" and "N".
- ✦ The DC voltage is available on the terminals marked "+" and "-". The second set of terminals are used when powering two transmitters from a single power supply (See notes).
- ✦ A red LED is illuminated when the power supply is "ON".

Notes: The power supply should be used to power two transmitters *only when* a single load cell is connected to each transmitter. For multiple load cell applications it is recommended that an individual power supply be used for each transmitter. This enables the power supply to compensate for any fluctuations in the incoming line voltage. Recent field experiences have shown that voltage drops of greater than 10% can cause the transmitters to drift and become unstable.



L N LED + -
115 Vac 24 Vdc

Fuse Replacement

- ✦ The following procedures require work inside the power supply enclosure and should be performed by qualified service personnel.
- ✦ Before opening the unit, disconnect the AC voltage.
- ✦ Remove the front cover from the power supply.
- ✦ Press down gently on the cover of the fuse holder, and turn counter-clockwise.
- ✦ Pull out the cover and fuse as an assembly, replace fuse with a new one.
- ✦ Re-install fuse and cover as an assembly, press down gently and turn clockwise.
- ✦ Replace the front cover on the power supply.
- ✦ Re-apply AC voltage to the unit.

In the event of a malfunction, please contact the nearest distributor for assistance.
Any attempt to modify or repair the power supply will void the manufacturers warranty.

EC DECLARATION OF CONFORMITY



We: Pavone Sistemi S.r.l.
Via dei Chiosi, 18
20040 CAVENAGO BRIANZA (MI)

Hereby declares that the product: **DAT 400**
Complies with the essential requirements of the directives 73/23/CEE, 89/336/CEE, 93/68/CEE, when used for its intended purpose

The product is made in accordance with the following standards

ELECTROMAGNETIC COMPATIBILITY:

EN 61000-3-2
EN 61000-3-3
EN 61000-6-2
EN 61000-6-3
EN 61326-1

ELECTRICAL SAFETY:

EN 61010-1

The CE mark has been applied on the product

Cavenago Brianza, April 15, 2004

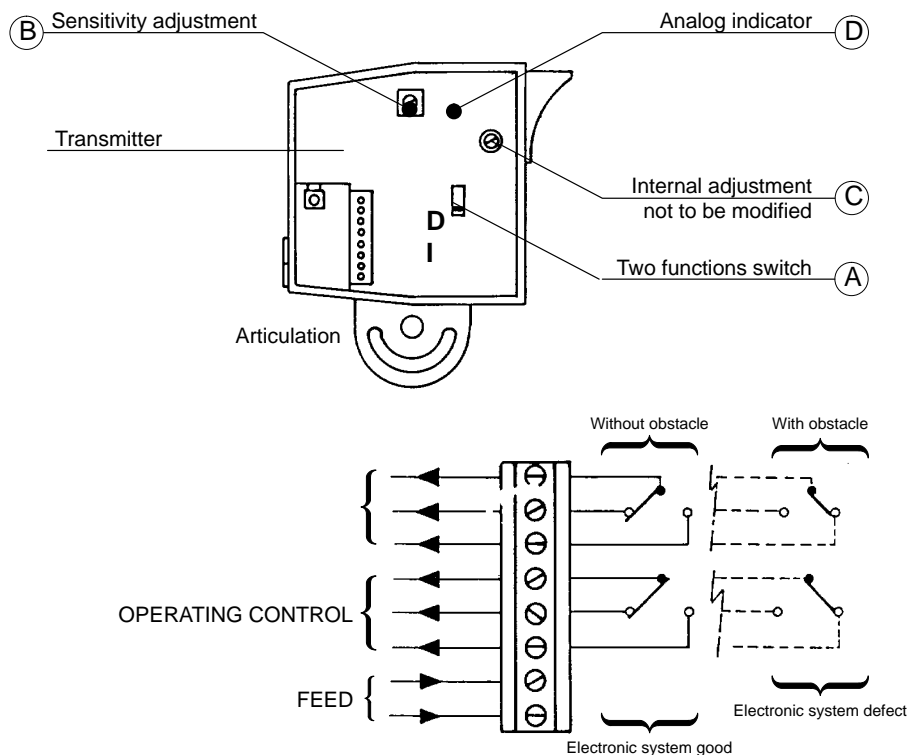
The Manager

7.8 LONG TRAVEL ANTI-COLLISION SYSTEM

1. DESCRIPTION

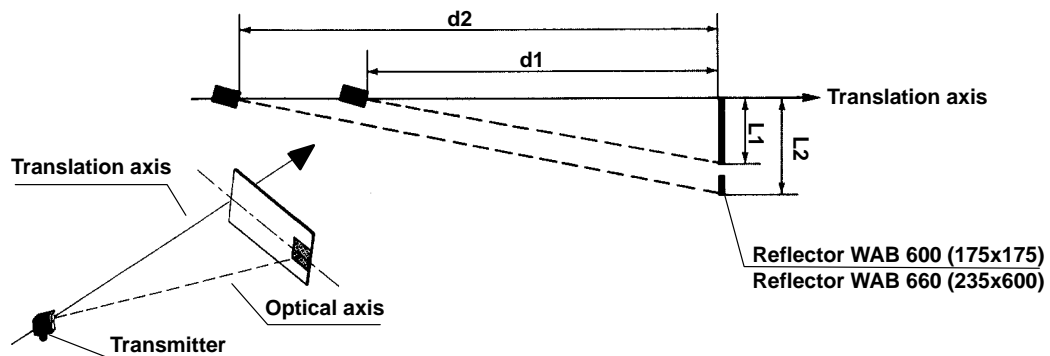
Note : For value of the detection distance, refer to the corresponding assembly drawing included in the installation manual or parts manual of the long travel trolley

Figure 1



Mechanical set up : The reflex system RXC works as shown on figure 2 (not perpendicularly to the reflector). Set the distance reflector sensor at (d) value required for stop, put a cardboard mask with a 10 x 10 cm window on the reflector. Adjust optical axis position to have the best signal on adjustment aid LED.

Figure 2



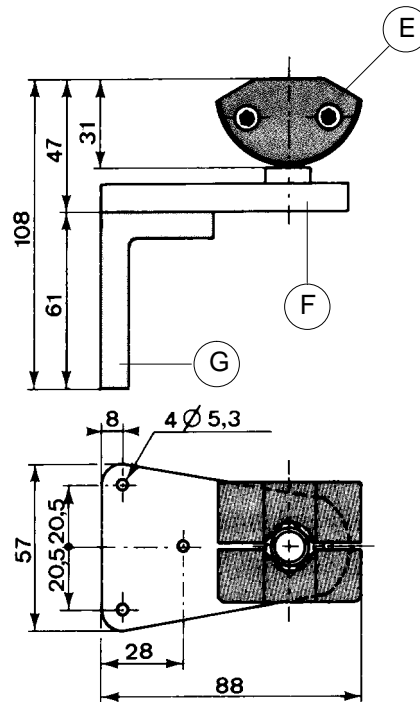
2. CONNECTION AND PRELIMINARY OPERATIONS

The fixing of the transmitter can be made using a vertical adjustment support (E) reference RXL 010, a horizontal adjustment support (F) reference RXL 020, a corner (G) reference RXL 030 and referring to the assembling drawing "ANTI-COLLISION SYSTEM".

- Set the switch (A) on "1" position.
- Proceed to the electrical connection referring to the cabling electrical diagram.
- Set the potentiometer of "sensivity adjustment" (B) on the "8" position.

Note : Do not modify the internal adjustment, adjustment screw (C).

Figure 3 : Example of fixing



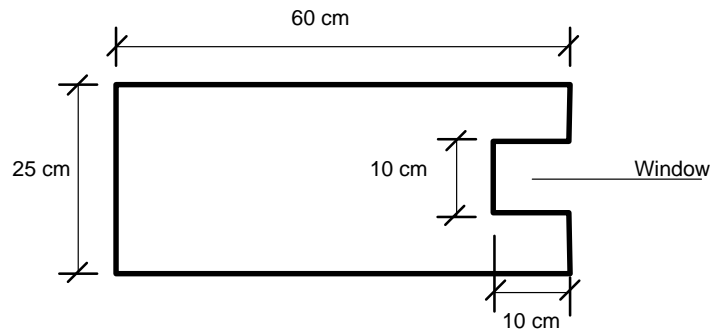
NON CONTRACTUAL VIEW

3. INSTRUCTIONS FOR ADJUSTMENT

3.1. PRELIMINARY

When adjustment you can use as a mesh card board with a window (10 x 10 cm)

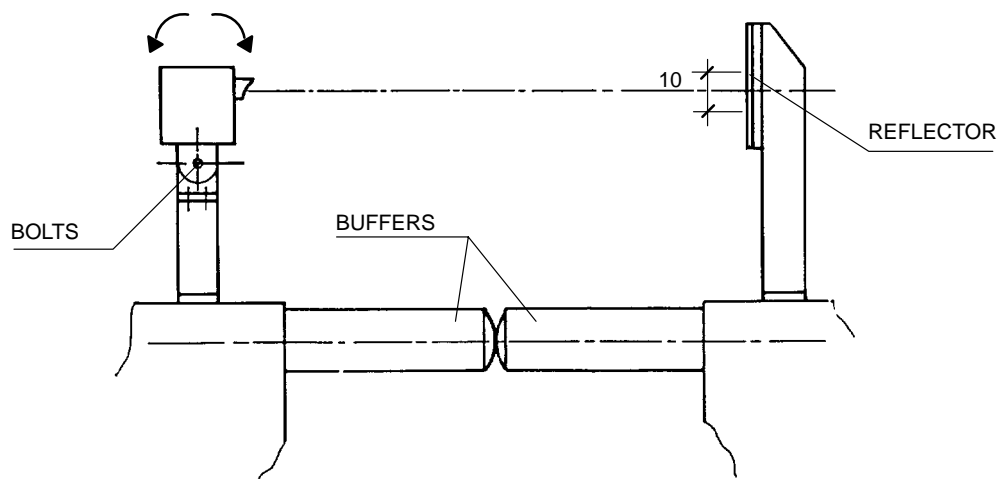
Figure 4



3.2. VERTICAL ADJUSTMENT

- Put the travelling cranes as close a possible to each other or against stopping buffers.
- Set sensitivity trimmer to obtain maximum brightness of the internal red light.
- Adjust the unit to have the light beam horizontal and perpendicular to the reflector.
- Tight the bolts of the vertical) setting.

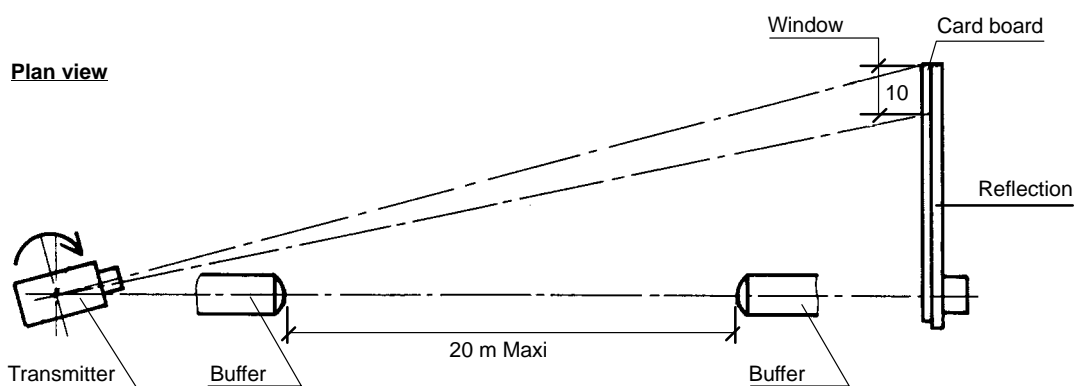
Figure 5 : Vertical adjustment



3.3. HORIZONTAL ADJUSTMENT

- Place the travelling cranes of the correct distance to get the stopping signal.
- Direct the unit to the edge of the reflector.
- Use the card board with a window (10 x 10 cm).
- Decrease the sensitivity up to limit of detection to get a sharp adjustment of the horizontal direction of the unit.
- Tighting the bolts of the horizontal setting.
- Adjust again the sensitivity to maximum.

Figure 6 : horizontal adjustment



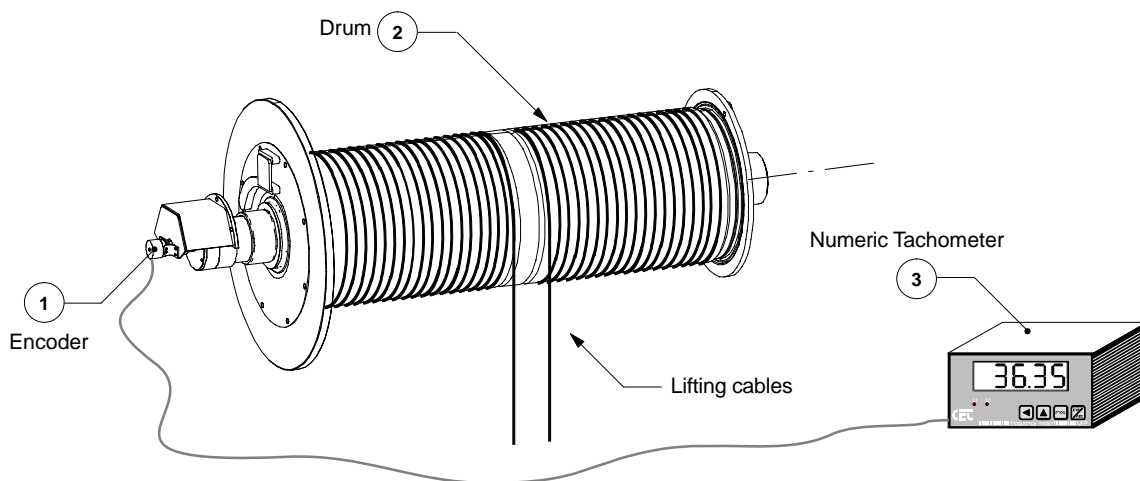
7.9 SPEED CONTROLLER FOR TAPPING TOOL LIFTING

1. PURPOSE AND DESCRIPTION

- **THE SPEED CONTROLLER**, fitted on the hoist unit allows to ensure the checking of the lifting speed during the down and raising movements.
- **THIS SYSTEM** check the rotation speed of lifting drum to detect an overspeed or an underspeed.
 - **The overspeed** will be reached if the rotation speed exceed too much the normal speed. This overspeed can be provoked, for example, by the breaking of a mechanical element located between the motor and the lifting drum.
 - **The underspeed** will be reached, if at the end of the starting period, the rotation speed remains too much below the normal speed.
- **THIS SYSTEM CONSISTS OF :**

1	An encoder to controlled the number of pulses and connected to the numeric tachometer.
2	Lifting drum, driven by the reducer, to lifting cable winding
3	A numeric tachometer type LFM42A measure (permanently) the time between every impulses. The value of this time is multiplied then divided by two coefficients which have been previously programed. The result of this calculation is compared with the overspeed and underspeed presets.

Figure 1 – Lifting drum and numeric tachometer



NON CONTRACTUAL VIEW

2. UNDERSPEED AND OVERSPEED OPERATIONS

2.1. UNDERSPEED

- At the beginning of the movement the underspeed control will become in operation after that the necessary time to obtain the nominal speed is reached (time delay 1 second).
- After this period, if the nominal speed is not reached the Tachometer will detect an underspeed.
- This underspeed will provoke :

The stopping of the lifting movement (Up and Down)
The closing of the safety brake and brake caliper
The operator will be able to control another lifting movement if any other fault forbids it. If the same fault continues, it will provoke a new stopping, in this case the intervention of a maintenance people is necessary

2.2. OVERSPEED

- After the starting period the overspeed will be permanently checked. If the drum rotation speed exceed the maxi rotation speed an overspeed fault will be detected.
- This overspeed fault will provoke :

The stopping of the lifting movement (Up and Down)
The closing of the safety brake and brake caliper
The memorizing of fault
<p>All lifting movements will be forbidden, the down and raise movements cannot be controlled by driving operator from the cab.</p> <p>In this case only a MAINTENANCE OPERATOR after checking (electrical and mechanical visual inspection) and lowering of the load, can proceed to the required maintenance and repair operations.</p> <p>IMPORTANT REMARK : "RESET" BUTTON</p> <p>After an overspeed fault detection the down movement can be carried out only by pushing on the "RESET" button located in the electric panel. This will provoke the safety brake opening and the down of the load in case of the brake caliper fault or in case of mechanical breaking between the motor shaft and the drum.</p>

3. ADJUSTMENT

3.1. ADJUSTEMENT PROCEDURE

For adjustment procedure refer to the configuration described in the electric diagram.

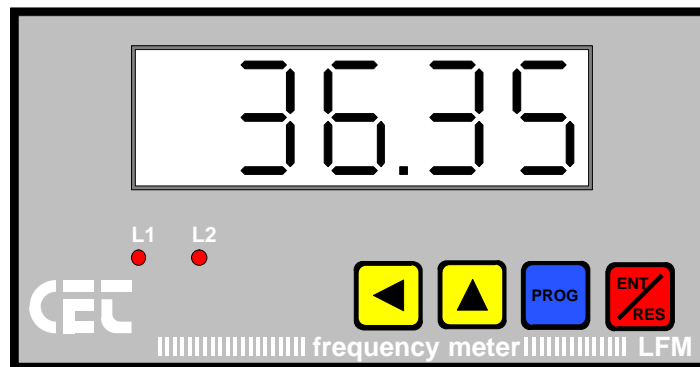
- Adjust the underspeed and overspeed parameter.
- Program the calculation parameters.
- Program the functionnnning parameters.



IMPORTANTE NOTE

The values of the parameters given to the electric diagram are intended only to the personnel of maintenance to carry out the adjustment of the speed controller at the time of the first startup of the equipment or at the time of the replacement of the frequency meter.

Figure 2 – Description of the LFM 42 font panel keyboard Frequency meter



L1
● DEL of visualisation – threshold 1 reached

L2
● DEL of visualisation – threshold 2 reached



In programming mode : Left movement of the cursor
In Normal mode : Temporary visualization of the registered parameters



In programming mode : increase of the value or twinkling symbol
In Normal mode : visualization on the digit of the total impulses



Enter / Exit the programming stage



In programming mode : Validate the value (ENT) & the following parameter appears
In Normal mode : Reset of the tachometer (RES)

A DEL on the rear side, indicate an input signal

NON CONTRACTUAL VIEW

3.2. ADJUSTMENT VALUES



IMPORTANTE NOTE

The adjustment values and characteristics below are given only by way of example to explain the operation and the programming of the speed controller

Refer you to the electric diagram section "programming of the controller" for the adjustments corresponding to your equipment.

3.2.1. DATA FOR THE TAPPING TROLLEYS (EXAMPLE)

- Motor speed $N = 1460 \text{ RPM}$
- Gear box ratio $A = 1 / 90.9$
- Drum rotation speed ... $NT = N \times A = \mathbf{16.06 \text{ RPM}}$
- Drum diameter $DT = 0,506 \text{ m}$
- Reeving $M = 6 \text{ (2 ropes x 6 strands)}$
- Vertical lifting speed ... $VL = (NT \times \Pi \times DT) / M = 4,25 \text{ m/min}$

3.2.2. DATA FOR SPEED CONTROLLER SYSTEM (EXAMPLE)

Encoder characteristics

- Number of pulses $T = 1024 \text{ pulses / revolution}$

Calculation parameters programming of the Tachometer

- Multiplier factor $FM = 1$
- Divider factor $Fd = 1$
- Time base $bt=1$

1=Time Base : seconds, measure visualisation in seconds (ex. Meters/second)

60=Time Base : minutes, measure visualisation in minutes (ex. Liters/minute)

3600=Time Base : hours, measure visualisation in hours (ex. Bottles/hour)

– Relays operating mode

–Programming of the operation Mode.....Md=2	
This programming allows to program the operation mode of the Set Points, of the Hysteresis and of the Relay Outputs.	
Md.=0	Two Lower Set Points (RL1 and RL2 excited under the Set Point value)
Md.=1	Two Upper Set Points (RL1 and RL2 excited over the Set Point value)
Md.=2	Upper Set Point + Lower Set Point (RL1 excited over the Set Point value and RL2 excited under the Set Point value)
Md.=3	Two Lower Set Points + maintained relay (RL1 and RL2 excited even Over the Set Points values; they can be reset after a RESET command or switching OFF and ON the instrument)
Md.=4	Two Lower Set Points + maintained relay (RL1 and RL2 excited even Under the Set Points values; they can be reset after a RESET command or switching OFF and ON the instrument)
Md.=5	One Upper Set Point and one Lower Set Point + maintained relay (the RL1 relay is always excited even Under the Set Point value and the RL2 relay is always excited even Over the Set Point value. It can be reset with a RESET command or switching OFF and ON the instrument)

–Programming of the RESET input and of the operation of the INHIBIT time.....Ut=1	
This programming allows to select the operation of the RESET input and the operation mode of the inhibit time.	
Ut.=0	Reset of the visualized value + relay (with inhibit time at the starting)
Ut.=1	Frequency Reset only + relay (with inhibit time at the starting)
Ut.=2	Frequency Reset + totalizer (at the same time) + relay (with inhibit time at the starting)
Ut.=3	Reset of the visualized value + relay (with inhibit time with the first impulse)
Ut.=4	Frequency Reset only + relay (with inhibit time with the first impulse)
Ut.=5	Frequency Reset + totalizer (at the same time) + relay (with inhibit time with the first impulse)

Operating parameters programming of the tachometer (See Electric diagram 1-10-248-90)

Temporizing of the relay (1) at the moment of energizing	E.= 0s
Temporizing of the relay (1) at the moment of de-energizing	d.= 0.2s
Temporizing of the relay (2) at the moment of energizing	E.= 0s
Temporizing of the relay (2) at the moment of de-energizing	d.= 0.2s
Automatic reset delay	tr = 1.0s
Display refresh time	td = 0s
Entry frequency selection <ul style="list-style-type: none"> – In = S if frequency < 25 Hz – In = F if frequency < 28KHz 	In.= F
Operation of the RESET key: This programing enable and disable the RESET working of the frontal RES key during the operation, <ul style="list-style-type: none"> – Executes the RESET of the visualized parameter and the RelaysOutput – Executes the RESET of the visualized parameter – RESET working of the RES key excluded – executes, at the same time, the RESET of the frequencymeter, of the totalizer and of the Relay Outputs 	rS.ou rS.on rS.oF rS.F.t
Programming of the Decimal Point: This programing allows to add a decimal point to the visualization on the 4 digits, in order to obtain counts with various resolutions, <ul style="list-style-type: none"> – Decimal Point excluded: visualization 9999 – Decimal Point on the second display from right: visualization 999,9 – Decimal Point on the third party display from right: visualization 99,99 – Decimal Point on the thourth display from right: visualization 9,999 – Floating Point 	d.p.=0 d.p.=1 d.p.=2 d.p.=3 d.p.=4
Initial time of inhibition of the activation of the Relay output: Allows to inhibit the activation of the relay outpout for the time sets. During this time the relay outpout is excluded. It's operation follows the programing in Ut. under the code 121. It's programmable between 0 (ecluded) and 999sec.	I=000
Activation mode of the programmed parameters: With this programming is possible to activate the executed programmings directly to the exit of the programming or, when exited of the programming, after a RESET (with frontal key or from rear input), <ul style="list-style-type: none"> – Activation of the parameters to the exit of the programming – Activation of the parameters to the exit of the programming after a RESET 	A.P.=P A.P.=r

Under /overspeed parameters

- Set point 1 (underspeed) SG1="UT value" (Section 3.2.3)
- Set point 2 (overspeed) SG2="OT value" (Section 3.2.4)

SG.1= SET POINT 1	Programmable between 0 and 9999
SG.2= SET POINT 2	Programmable between 0 and 9999

Input type

- For the encoder (1–10–044–78), select the PNP type by switches on the back of the speed controller.

3.2.3. FIRST THRESHOLD : UNDERSPEED (EXAMPLE)**3.2.3.1. WITHOUT VARIABLE FREQUENCY DRIVE (EXAMPLE)**

The underspeed is detected if (after the starting period) the drum rotation speed is 10 % lower at the normal speed NT.

UNDERSPEED \Rightarrow Speed < 0,9 NT

Underspeed value : $UV = 0,9 \times NT = 0,9 \times 16,06 = 14,45 \text{ tr/mn}$

Underspeed threshold : $UT = T \times UV / 60 = 1024 \times 14,45 / 60 = 246,61 \text{ Hz}$

UNDERSPEED THRESHOLD (UT) = 246,61 Hz

3.2.3.2. WITH VARIABLE FREQUENCY DRIVE

The fixed Threshold : 2 Hz.

3.2.4. SECOND THRESHOL : OVERSPEED (EXAMPLE)

The overspeed is detected if the drum rotation speed is 10 % upper at the normal speed NT.

OVERSPEED \Rightarrow Speed > 1,1 NT

Overspeed value : $OV = 1,1 \times NT = 1,1 \times 16,06 = 17,66 \text{ tr/mn}$

Overspeed threshold : $OT = T \times OV / 60 = 1024 \times 17,66 / 60 = 301,397 \text{ Hz}$

OVERSPEED THRESHOLD (OT) = 301,397 Hz

3.2.5. AVERAGE THRESHOLD : (EXAMPLE)

Average speed value : $(OV - UV) / 2 + UV = (17,66 - 14,45) / 2 + 14,65 \simeq 16 \text{ tr/mn}$

Average speed threshold : $(OT - UT) / 2 + UT = (301,397 - 246,61) / 2 + 246,61 \simeq 274 \text{ Hz}$

4. PERIODIC INSPECTION

The speed controller system must be periodically checked by a maintenance operator, who having enquire this notice.

The operator must realised a lifting motion to control the nominal speed of lifting and if the speed displayed is constant. (in our example : 274 Hz)

5. APPENDIX

5.1. ENCODER ASSEMBLY

Encoder :

Maker : SICK-STEMMANN

Ref : DRS 60-EDM 01024

ECL Code : 1-10-044-78

Voltage supply : 24 Vdc

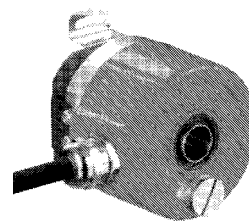
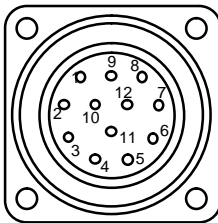
Sleeve : (NR)

Maker : SICK-STEMMANN

Ref : SPZ-012-AD-D

ECL Code : 1-10-049-65

Figure 4 : Encoder characteristics



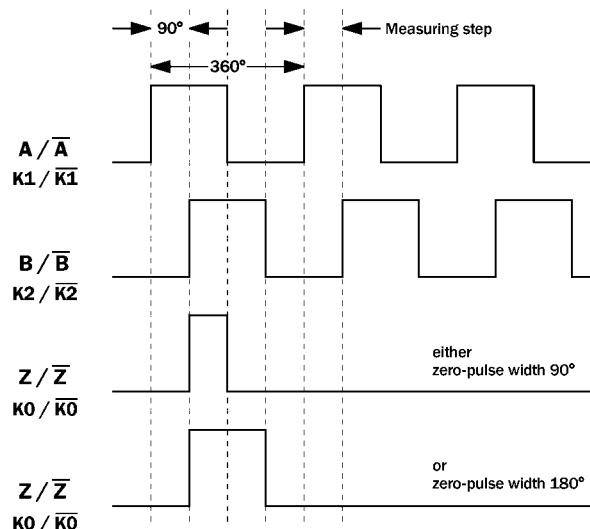
PIN and wire allocation/cable 11 core

PIN	Signal	Wire colour (Cable outlet)	Explanation
1	\bar{B} or /K2	black	Signal line
2	Sense +	grey	Connected internally to U_s
3	Z or K0	lilac	Signal line
4	\bar{Z} or /K0	yellow	Signal line
5	A or K1	white	Signal line
6	\bar{A} or /K1	brown	Signal line
7	N. C.	orange	Not connected
8	B or K2	pink	Signal line
9	Screen		Housing potential
10	GND	blue	Zero volt connected to the encoder
11	Sense -	green	Connected internally to GND
12	U_s	red	Supply voltage ¹⁾

View of the connector M23 fitted
to the encoder body

¹⁾ Potential free to
housing
N. C. =
Not connected

Incremental pulse diagram



NON CONTRACTUAL VIEW

5.2. TACHOMETER LFM42-A

Maker : CET CONTROL SYSTEM

Ref : LFM42-A

ECL Code : 0-03-244-65 (Supply 110 Vac / 24 Vdc)

0-03-244-67 (Supply 230 Vac / 24 Vdc)

Figure 5 – Dimension of the frequency meter LFM 42

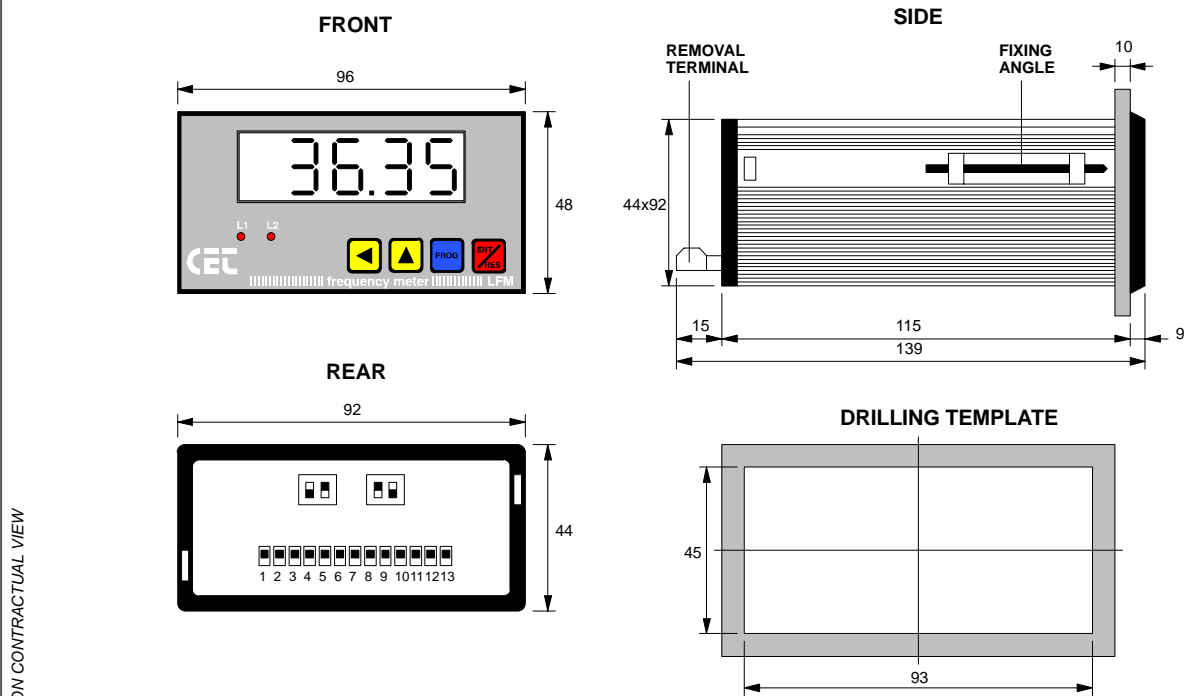


Figure 6 – Frequency meter LFM42 connection

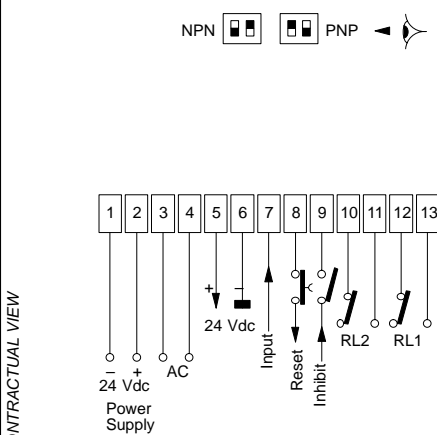
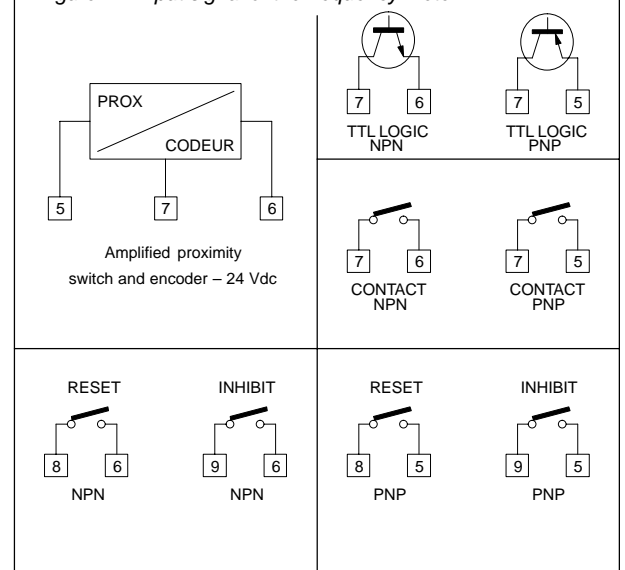


Figure 7 – Input signal of the frequency meter



7.10 INSULATOR CONTROL DEVICE

Function / Location	ECL Code	SYSTEM
Tourret electrical components	1-10-925-66	SILVER





E.C.L.™ – 100, rue Chaland
59 790 Ronchin – FRANCE
Tél. (33) 03.20.88.70.70
Fax. (33) 03.20.88.70.99

Document title

**PREVENTIVE MAINTENANCE
FOR SYSTEMS
FOR PERMANENT MONITORING
OF PTA INSULATION**

Doc number Rev
Doc_SILver02 02

Drawn up by
Didier LHEUREUX

Commodity Code Rev
1-10-205-80

Date: Dec/05 Folio 1/13

6			Checked by Approved by	
5			Checked by Approved by	
4			Checked by Approved by	
3			Checked by Approved by	
2	01/06/06	Corrections after APAVE reading	Checked by Approved by	MARCHAND Patrick LHEUREUX Didier
1	12/05/06	Corrections	Checked by Approved by	MARCHAND Patrick LHEUREUX Didier
0	09/12/05	Creation	Checked by Approved by	LHEUREUX Didier MARCHAND Patrick
REV	DATE	DESCRIPTION		NAME



E.C.L.™ – 100, rue Chaland
59 790 Ronchin – FRANCE
Tél. (33) 03.20.88.70.70
Fax. (33) 03.20.88.70.99

Document title

PREVENTIVE MAINTENANCE FOR SYSTEMS FOR PERMANENT MONITORING OF PTA INSULATION

Doc number	Rev
Doc_SILver02	02
Drawn up by	
Didier LHEUREUX	
Commodity Code Rev	
1-10-205-80	
Date: Dec/05	Folio 1/13

1. OBJECTIVE:	2
2. PREREQUISITES:	2
3. PROCEDURE FOR CHECKING STRUCTURAL INSULATION.....	3
3.1. VISUAL INSPECTION OF THE STATE OF THE STRUCTURAL INSULATION	3
3.2. MEASUREMENT OF THE EQUIVALENT RESISTANCE OF THE INSULATION BETWEEN GROUNDS	3
3.3. CHECKING THE SINGLE POLE ISOLATORS OF THE DIFFERENT GROUNDS	3
3.4. OPERATION OF THE CPI-S	3
3.5. TEST OF PROPER OPERATION.....	3
3.6. CHECKING THE ADJUSTMENT OF THE CPI-S.....	4
3.7. CHECKING THE CONSISTENCY OF THE INDICATIONS	4
3.8. CHECKING THE OPERATION OF THE PUSH BUTTONS.....	5
3.8.1. Checking the operation of the CPI-S and the ground connections.....	5
3.8.2. Cable connection between grounds A and B	5
3.8.3. Cable connection between grounds B and C.....	5
3.8.4. Checking the integrity of all the connections.....	7
3.8.5. Checking the insulation fault on the 24Vdc circuit.....	7
4. PROCEDURE FOR CHECKING POWER CIRCUIT INSULATION.	8
4.1. VISUAL INSPECTION OF THE STATE OF THE POWER CIRCUITS	8
4.2. CHECKING THE INSULATION OF EACH DISTRIBUTED POWER CIRCUIT	8
4.3. VERIFICATION OF THE ADJUSTMENT OF THE CPI-AC.....	8
4.3.1. Checking the configuration of the CPI-ac	8
4.4. CHECKING THE CONSISTENCY OF THE INDICATIONS	9
4.5. CHECKING THE OPERATION OF THE PUSH BUTTONS.....	9
4.5.1. Checking the proper operation of the CPI-ac and the measurement cable connections.....	10
4.5.2. Receivers on ground B.....	10
4.5.3. Receivers on ground C.....	11
4.6. MEASUREMENT OF THE INSULATION OF THE CONTROL CIRCUITS	13
4.6.1. Visual inspection.....	13
4.6.2. Test of the differential circuit breakers.....	13



E.C.L.™ – 100, rue Chaland
59 790 Ronchin – FRANCE
Tél. (33) 03.20.88.70.70
Fax. (33) 03.20.88.70.99

Document title

PREVENTIVE MAINTENANCE FOR SYSTEMS FOR PERMANENT MONITORING OF PTA INSULATION

Doc number	Rev
Doc_SILver02	02
Drawn up by	
Didier LHEUREUX	
Commodity Code Rev	
1-10-205-80	
Date: Dec/05	Folio 2/13

1. OBJECTIVE:

The objective of this document is to describe a procedure for preventive monitoring of devices for permanent insulation monitoring (between grounds, between grounds and electric power circuits, or of control/command circuits).

2. PREREQUISITES:

It is **imperative** that the PTA (pot tending machine) be placed in a safe storage zone in a maintenance shop to carry out the different checking procedures. Moreover, the machine must be cleaned, which implies:

- complete removal of dust by aspiration
- cleaning
 - of the oily and soiled parts
 - of the *structural insulation* (particular care to be taken with the insulating parts)
 - of the cab
 - of the premises and *electrical boxes*... (SILver especially!)



The insulation box must be considered a **DANGER ZONE**.

All interventions must be carried out:

- * by a specially trained person
 - * on a machine placed outside of the field of the pots or other high voltage zones
-



E.C.L.™ – 100, rue Chaland
59 790 Ronchin – FRANCE
Tél. (33) 03.20.88.70.70
Fax. (33) 03.20.88.70.99

Document title

PREVENTIVE MAINTENANCE FOR SYSTEMS FOR PERMANENT MONITORING OF PTA INSULATION

Doc number	Rev
Doc_SILver02	02
Drawn up by	
Didier LHEUREUX	
Commodity Code Rev	
1-10-205-80	
Date: Dec/05	Folio 3/13

3. PROCEDURE FOR CHECKING STRUCTURAL INSULATION

The frequency of inspection for the structural insulation is normally every 4 months.

The main circuit breaker of the PTA must be open.

3.1. Visual inspection of the state of the structural insulation

Inspection of all the insulation between earth A (beam) and the grounds Bx

Inspection of all the insulation between the grounds Bx and the grounds Cx

Reminder: a different color is associated with each one of the 3 grounds.

3.2. Measurement of the equivalent resistance of the insulation between grounds

This measurement must be carried out using a 1500V dc megger in contact with bolts on the different grounds.



To avoid having the presence of the CPI-S disturb the test, it is necessary to disconnect the leads "E & KE" of the latter, or the leads to the copper bar of ground B (otherwise, the internal impedance of the monitor will be detected).

The minimum resistance must be greater than **10 Megohms**.

3.3. Checking the single pole isolators of the different grounds

Open the single pole isolators located in the LV distribution cabinets.

3.4. Operation of the CPI-S

Close the circuit breaker located in the SILver box of the PTA and check that the CPI-S monitor is in fact supplied with power.

3.5. Test of proper operation

Check the operation of the permanent insulation monitor by pressing the TEST key on the front face (all the LEDs on the CPI-S should light up).



The permanent insulation monitor must be replaced by a new one every 5 years, in order to observe the SIL1 level of operating safety.



E.C.L.™ – 100, rue Chaland
59 790 Ronchin – FRANCE
Tel. (33) 03.20.88.70.70
Fax. (33) 03.20.88.70.99

Document title

PREVENTIVE MAINTENANCE FOR SYSTEMS FOR PERMANENT MONITORING OF PTA INSULATION

Doc number Rev
Doc_SILver02 02
Drawn up by
Didier LHEUREUX
Commodity Code Rev
1-10-205-80
Date: Dec/05 Folio 4/13

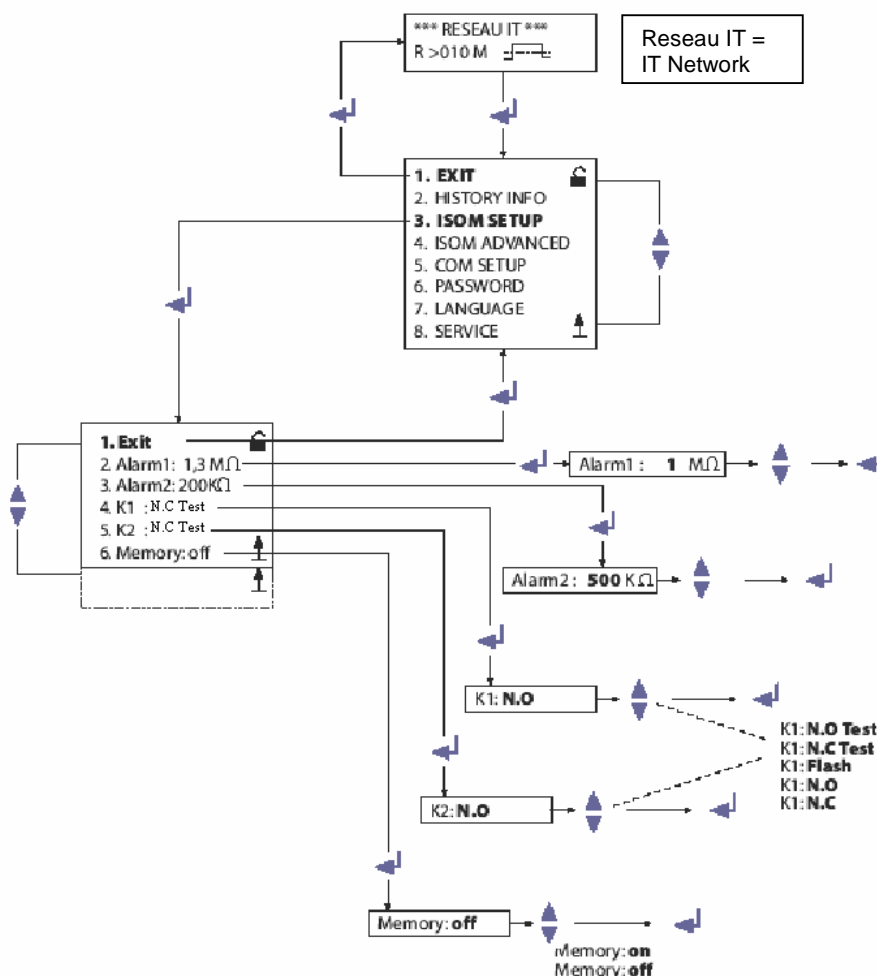
3.6. Checking the adjustment of the CPI-S

The detection thresholds have been parameterized in the E.C.L. workshops. The values can be read directly from the CPI-S display. The configuration should be as follows:

- Alarm1: 1.3M Ω
- Alarm2: 200k Ω
- K1: N.C Test
- K2: N.C Test

Memory: off
Auto-test: 1h
Measurement principle: AMP

Diagram of ISOM SETUP



3.7. Checking the consistency of the indications

After closing all the single pole isolators, check that the CPI-S displays a value consistent with that found using the megohmmeter.



E.C.L.™ – 100, rue Chaland
59 790 Ronchin – FRANCE
Tél. (33) 03.20.88.70.70
Fax. (33) 03.20.88.70.99

Document title

PREVENTIVE MAINTENANCE FOR SYSTEMS FOR PERMANENT MONITORING OF PTA INSULATION

Doc number	Rev
Doc_SILver02	02
Drawn up by	
Didier LHEUREUX	
Commodity Code Rev	
1-10-205-80	
Date: Dec/05	Folio 5/13

3.8. Checking the operation of the push buttons

Check the push buttons on the boxes. Each time it is pressed, the button should light up (green).

3.8.1. **Checking the operation of the CPI-S and the ground connections**

The proper operation of the CPI-S is validated by short circuiting the insulation.

3.8.2. **Cable connection between grounds A and B**

For each of the grounds Bx

- Check that the chain of contacts (between terminals 7 & 11) which control the operation of the CPI-S is in fact closed.
- Pressing the light-up push button "MANU BP MEASURE A-B" automatically puts the measurement in maintenance mode for 10 minutes.
- Short circuit an insulator connecting grounds A and B, taking care that the connection is correctly established (e.g., on a bolt of the ground).
The CPI-S relay should activate and its display indicate "R > 100k" (waiting time less than 30 s).
Make sure that the indicator light "STRUCTURE FAULT" on the box is illuminated (LEDs 1 & 2), and check also the associated device (horn, flash lamp, etc.). Check that the information is in fact sent back to the automatic control.
- Open the single pole isolator concerned. The resistance value on the display should increase.

Proper operation now being demonstrated ...

- Remove the short circuit on the insulator and re-close the single pole isolator. The CPI-S relay should again be switched on.
- Re-arm the "insulation fault" detection sequence by pressing the Reset push button located in the box.
- The lamp should go out, as well as the associated device.

3.8.3. **Cable connection between grounds B and C**

For each of the grounds Cx

- Check that the chain of contacts which controls the operation of the CPI-S is in fact closed.
- Pressing the light-up push button "MANU BP MEASURE B-C" automatically puts the measurement in maintenance mode for 10 minutes.
- Short circuit an insulator connecting grounds B and C, taking care that the connection is correctly established (e.g., on a bolt of the ground).
The CPI-S relay should activate and its display indicate "R > 100k" (waiting time less than 30 s). Check that the "STRUCTURE FAULT" indicator light on the box lights up (LEDs 1 & 2), and also check the associated device (horn, flash lamp, etc.). Check that the information is in fact sent back to the automatic control.
- Open the single pole isolator concerned. The resistance value on the display should increase.

Proper operation now being demonstrated...



E.C.L.™ – 100, rue Chaland
59 790 Ronchin – FRANCE
Tél. (33) 03.20.88.70.70
Fax. (33) 03.20.88.70.99

Document title

PREVENTIVE MAINTENANCE FOR SYSTEMS FOR PERMANENT MONITORING OF PTA INSULATION

Doc number Rev
Doc_SILver02 02
Drawn up by
Didier LHEUREUX
Commodity Code Rev
1-10-205-80
Date: Dec/05 Folio 6/13

- Remove the short-circuit on the insulator and re-close the single pole isolator. The CPI-S relay should again be switched on.
- Re-arm the "insulation fault" detection sequence by pressing the Reset push button located in the box.
- The indicator light should go out, as well as the associated device.

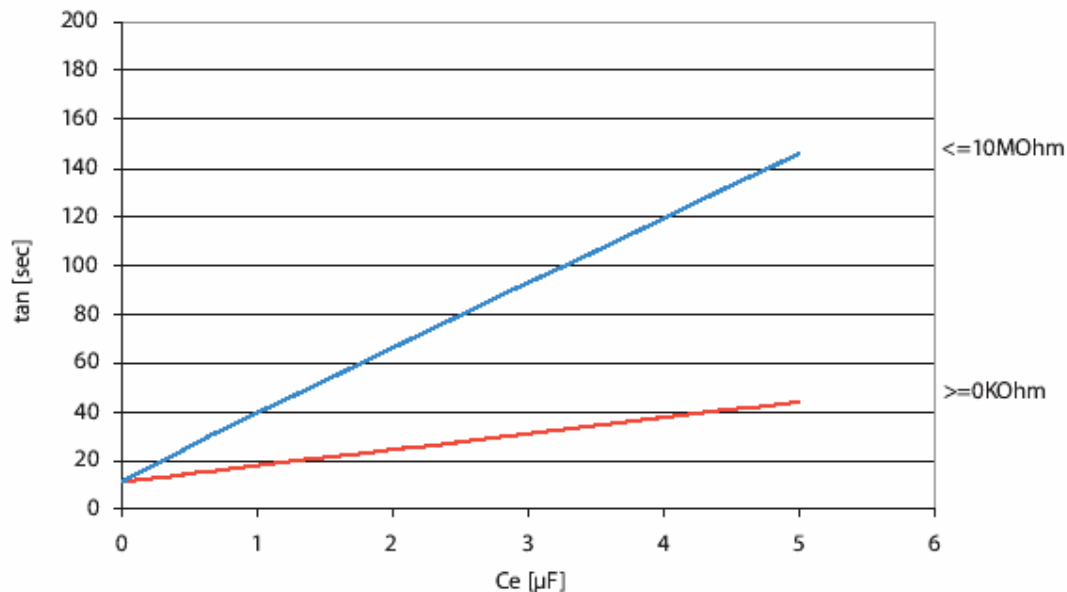
Note:

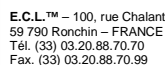
The short-circuit between the grounds allows one, in a single check, to verify that the 2 thresholds, Fault (200 kOhms) and Alarm (1.3 MOhms), are operating correctly.

If the alarm only is to be tested, one only needs to reproduce the sequence previously described in inserting a resistance R (lying between 200kOhms and 1.3 MOhms) between the "connected" grounds.

When the CPI-S relay is triggered, only LED 1 should illuminate. The display will show a value for the range which should be consistent with that of the inserted resistance.

**Response time of the CPI ISOM as a function of the leakage capacities:
Ce = 0..5 μ F, f = 50 Hz**





PREVENTIVE MAINTENANCE FOR SYSTEMS FOR PERMANENT MONITORING OF PTA INSULATION

<i>Doc number</i>	Rev
Doc_SILver02	02
<i>Drawn up by</i>	
Didier LHEUREUX	
<i>Commodity Code Rev</i>	
1-10-205-80	
Date: Dec/05	Folio 7/13

(frequency: every 4 months)

Verification of the connections at the level of the terminals in the SILver box.

Check on the integrity of the ground cables

- fixed on the different parts monitored (instruments, etc.)
- on the equipotential bonding bars.

Cut off the 24V dc power supply in the box and verify using an ohmmeter that the +24V and the 0 (zero) are not connected to the SILver chassis.



E.C.L.™ – 100, rue Chaland
59 790 Ronchin – FRANCE
Tél. (33) 03.20.88.70.70
Fax. (33) 03.20.88.70.99

Document title

PREVENTIVE MAINTENANCE FOR SYSTEMS FOR PERMANENT MONITORING OF PTA INSULATION

Doc number	Rev
Doc_SILver02	02
Drawn up by	
Didier LHEUREUX	
Commodity Code Rev	
1-10-205-80	
Date: Dec/05	Folio 8/13

4. PROCEDURE FOR CHECKING POWER CIRCUIT INSULATION

The main circuit breaker of the PTA must be open.

4.1. VISUAL INSPECTION OF THE STATE OF THE POWER CIRCUITS

(frequency: every 4 months)

In the cabinets and boxes, visually inspect the power cables and check the connections.

On the exterior, check that the power cables and the protective sheaths are not damaged (damage, degradation).

4.2. CHECKING THE INSULATION OF EACH DISTRIBUTED POWER CIRCUIT



The motors must not in any circumstances be powered during the check! (contactor open).

Check of the insulation with a 500V megger (megohmmeter) downstream of the contactors between a phase of each motor and the grounds concerned.

The minimum resistance must be greater than **5 Megohms**.

4.3. VERIFICATION OF THE ADJUSTMENT OF THE CPI-ac

(frequency: at each maintenance)

Close the main circuit breaker to power the CPI-ac relay.

4.3.1. Checking the configuration of the CPI-ac

The detection thresholds have been parameterized in the E.C.L. workshops. The values can be directly read from the display of the CPI-ac. The following configuration should be read:

- Alarm1: 500kΩ
- Alarm2: 500kΩ
- K1: N.C Test
- K2: N.C Test
- Memory: off
- Auto-test: 1h
- Measurement principle: AMP



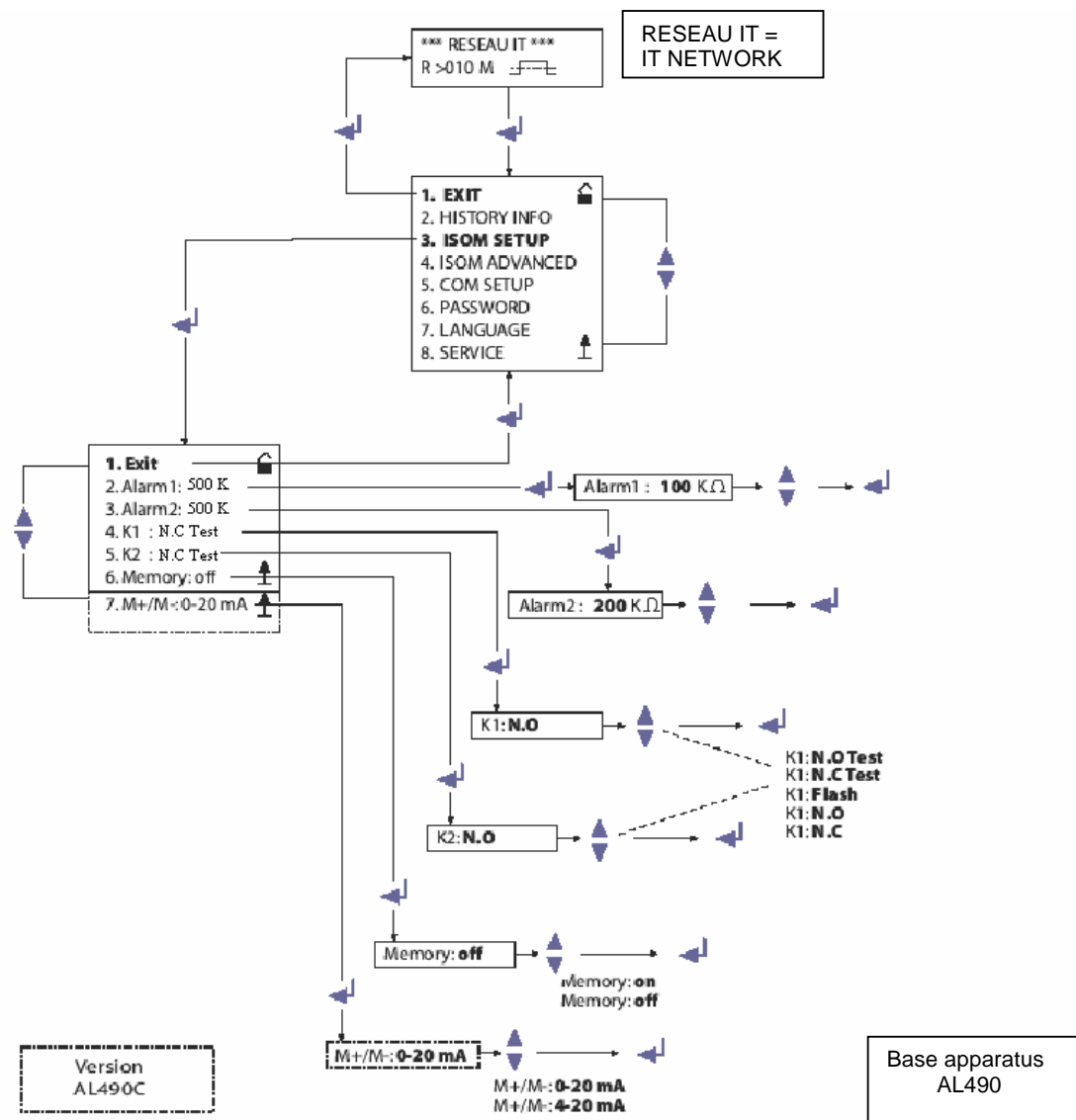
E.C.L.™ – 100, rue Chaland
59 790 Ronchin – FRANCE
Tél. (33) 03.20.88.70.70
Fax. (33) 03.20.88.70.99

Document title

PREVENTIVE MAINTENANCE FOR SYSTEMS FOR PERMANENT MONITORING OF PTA INSULATION

Doc number Rev
Doc_SILver02 02
Drawn up by
Didier LHEUREUX
Commodity Code Rev
1-10-205-80
Date: Dec/05 Folio 9/13

Diagram of the ISOM SETUP



4.4. Checking the consistency of the indications

After closing all the single pole isolators, verify that the CPI-ac displays a value consistent with that read using the megohmmeter.

4.5. Checking the operation of the push buttons

Check the push buttons on the boxes. Each time it is pressed, the button should light up (green).



E.C.L.™ – 100, rue Chaland
59 790 Ronchin – FRANCE
Tél. (33) 03.20.88.70.70
Fax. (33) 03.20.88.70.99

Document title

PREVENTIVE MAINTENANCE FOR SYSTEMS FOR PERMANENT MONITORING OF PTA INSULATION

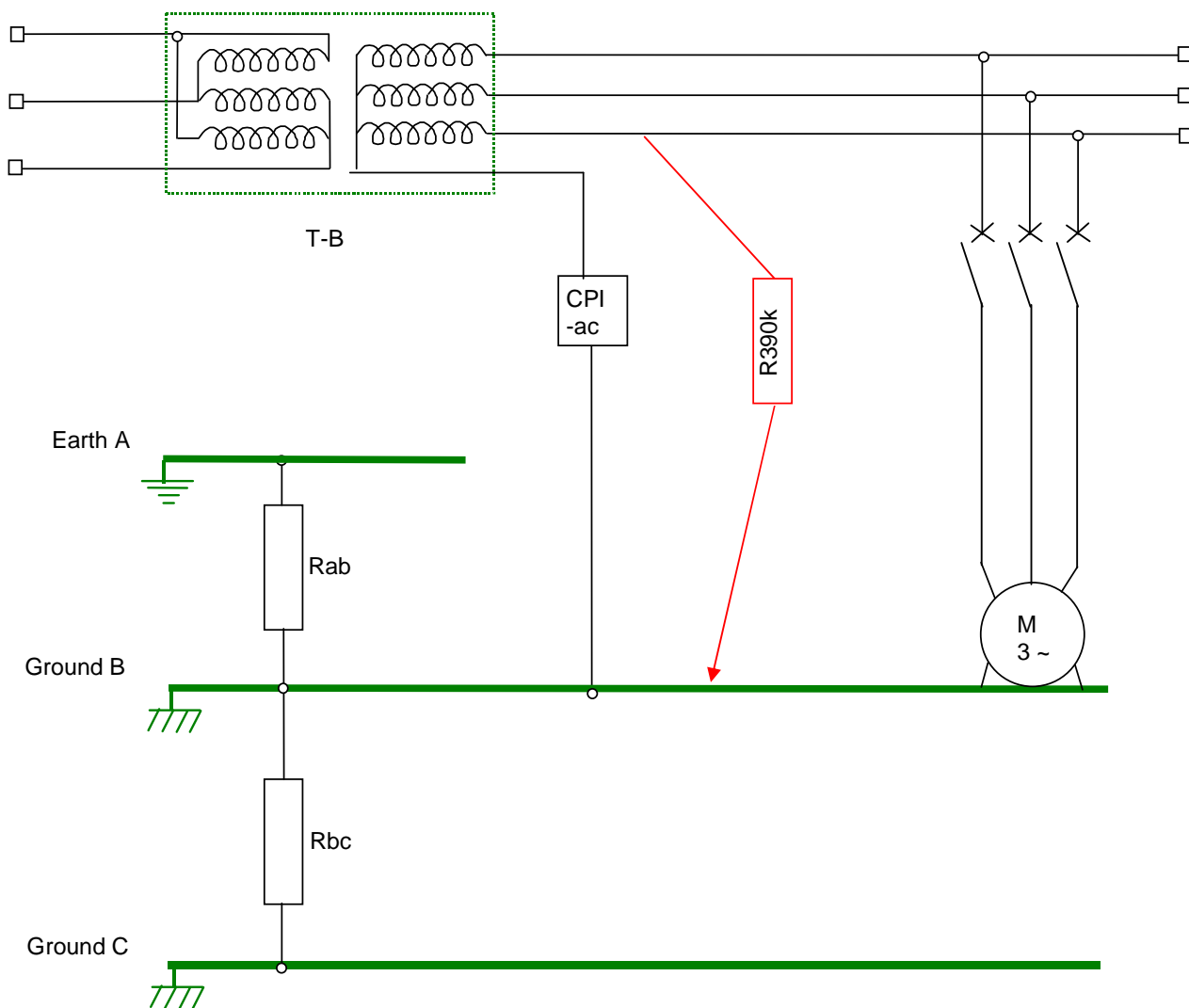
Doc number	Rev
Doc_SILver02	02
Drawn up by Didier LHEUREUX	
Commodity Code Rev 1-10-205-80	
Date: Dec/05	Folio 10/13

4.5.1. Checking the proper operation of the CPI-ac and the measurement cable connections

The proper operation of the CPI-ac is checked by a fault limited by a known resistance of approximately 400 kOhms between the phase of the transformer supplying the receivers and the ground of these latter.

4.5.2. Receivers on ground B

- Check that the measurement loop which controls the operation of the CPI-ac is in fact closed.
- Pressing the light-up push button "MANU BP MEASURE NT-B" automatically puts the measurement in maintenance mode for 10 minutes.
- Put a polarity on ground B through a resistance, taking care that the connection is properly established (e.g., on a bolt of the ground).





E.C.L.™ – 100, rue Chaland
59 790 Ronchin – FRANCE
Tel. (33) 03.20.88.70.70
Fax. (33) 03.20.88.70.99

Document title

PREVENTIVE MAINTENANCE FOR SYSTEMS FOR PERMANENT MONITORING OF PTA INSULATION

Doc number Rev
Doc_SILver02 02
Drawn up by
Didier LHEUREUX
Commodity Code Rev
1-10-205-80
Date: Dec/05 Folio 11/13

The CPI-ac relay should be triggered and its display indicate "R =" value of the test Resistance (waiting time less than 10s).

Ensure that the indicator "POWER FAULT" on the box is illuminated (LEDs 1 & 2 on the CPI-ac), and check also that the associated device (flash lamp, etc.) is in fact activated. Make sure that the information is in fact sent back to the automatic control.

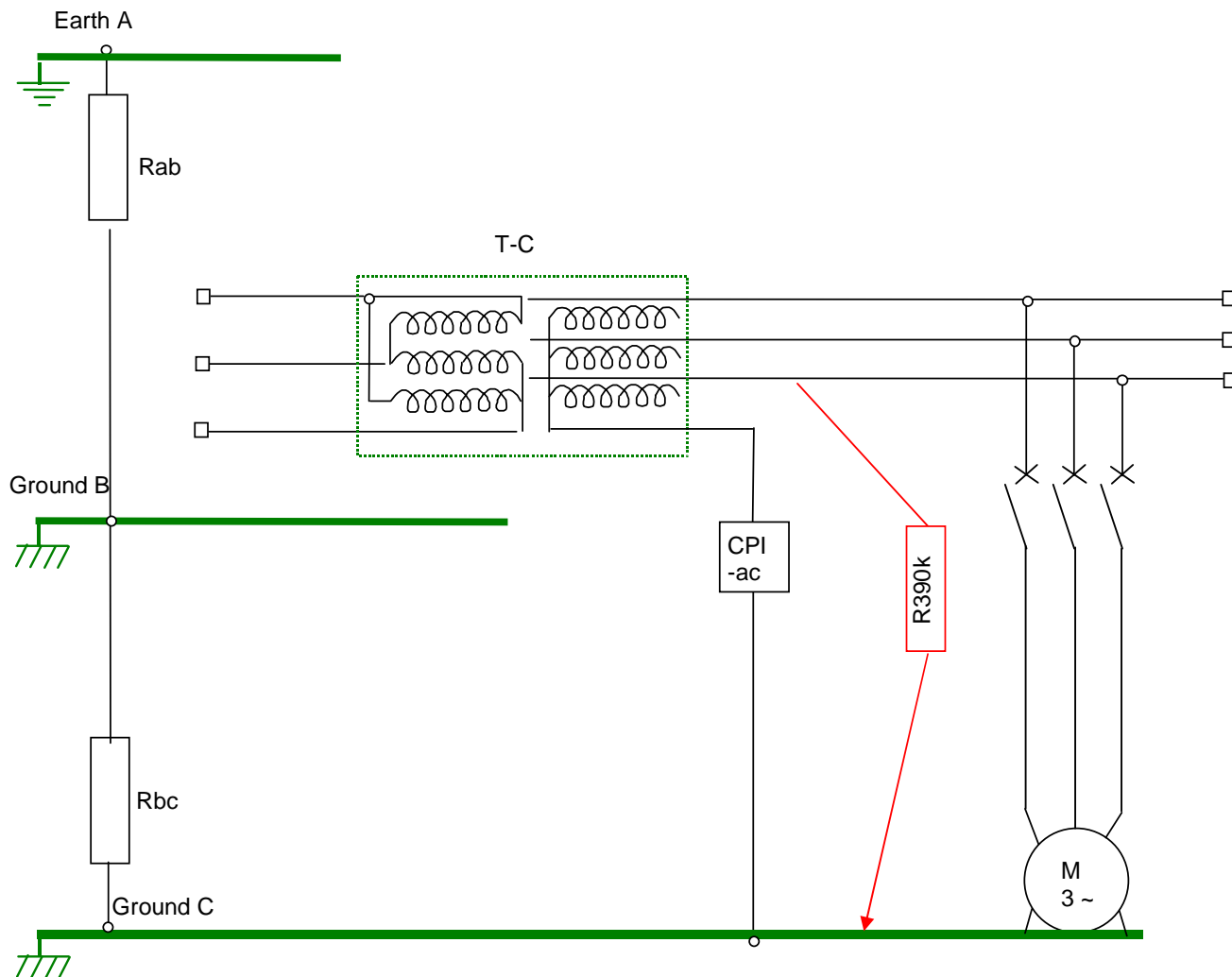
- Remove the connection. The value of the resistance on the display should increase.

Proper operation now being demonstrated...

- The CPI-ac relay should again be engaged.
- Re-arm the "power fault" detection sequence by pressing on the Reset push button located in the box.
- The lamp should be extinguished, as well as the associated device.

4.5.3. Receivers on ground C

- Pressing the light-up push button "MANU BP MEASURE NT-C" automatically puts the measurement in maintenance mode for 10 minutes.
- Put a polarity on ground C through a resistance, taking care that the connection is correctly established (e.g., on a bolt of the ground).





E.C.L.TM – 100, rue Chaland
59 790 Ronchin – FRANCE
Tél. (33) 03.20.88.70.70
Fax. (33) 03.20.88.70.99

Document title

**PREVENTIVE MAINTENANCE
FOR SYSTEMS
FOR PERMANENT MONITORING
OF PTA INSULATION**

Doc number	Rev
Doc_SILver02	02
Drawn up by	
Didier LHEUREUX	
Commodity Code Rev	
1-10-205-80	
Date: Dec/05	Folio 12/13

The CPI-ac relay should be activated and its display indicate "R = " the value of the test Resistance (waiting time less than 10s).

Ensure that the indicator light "POWER FAULT" on the box lights up (LEDs 1 & 2 on the CPI-ac), and also check that the associated device (flash lamp, etc.) is in fact activated. Check that the information is in fact sent back to the automatic control.

- Remove the connection ... The value of the resistance on the display should increase.

Proper operation now being demonstrated...

- The CPI-ac relay should again be engaged.
- Re-arm the "power fault" detection sequence by pressing on the Reset push button located in the box.
- The lamp should be extinguished, as well as the associated device.

Note: if the verification procedures 4.5.2 & 4.5.3 are correctly applied, and the results consistent with those expected, one can conclude that the RHT4 & RHT5 relays are operating correctly.

In fact,

if the RHT4 is faulty

- * on 1 contact, the KE & E connection will be cut, which then would be detected by the monitor.
- * on 2 contacts, the short circuit will not be detected during one of the 2 verification procedures.

if the RHT5 is faulty

- * on 1 contact, the L1 & L2 connection will be cut, which then would be detected by the monitor.
- * on 2 contacts, the short circuit will not be detected during one of the 2 verification procedures.



E.C.L.™ – 100, rue Chaland
59 790 Ronchin – FRANCE
Tél. (33) 03.20.88.70.70
Fax. (33) 03.20.88.70.99

Document title

PREVENTIVE MAINTENANCE FOR SYSTEMS FOR PERMANENT MONITORING OF PTA INSULATION

Doc number	Rev
Doc_SILver02	02
Drawn up by	
Didier LHEUREUX	
Commodity Code Rev	
1-10-205-80	
Date: Dec/05	Folio 13/13

4.6. Measurement of the insulation of the control circuits

The main circuit breaker of the PTA must be open.

4.6.1. Visual inspection...

(frequency: every 6 months)

In the cabinets and boxes

- _ ... of the attachment and appearance of the equipment
- _ ... of the cabling (verification of the connections) and of the control wiring

Ensure especially that all the cables are connected, and if necessary eliminate unnecessary wiring.

On the exterior

Verify that the control cables are not damaged (damage, degradation).

The emergency stop sequence will be monitored by auto-test (and by operation).

Check the state:

- * of the connections with the sensors and actuators, especially for connections subject to deformation (ex: festoons, cables on chains, etc.)
- * of the sensors and connections
- * of the actuators and connections

4.6.2. Test of the differential circuit breakers

(if applicable)

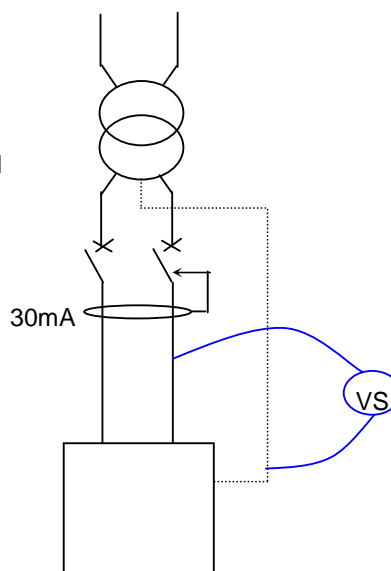
Press the "test" button on the apparatus and check that it is triggered.

Or apply the method described below:

For the 230V ac and for the 110V ac:

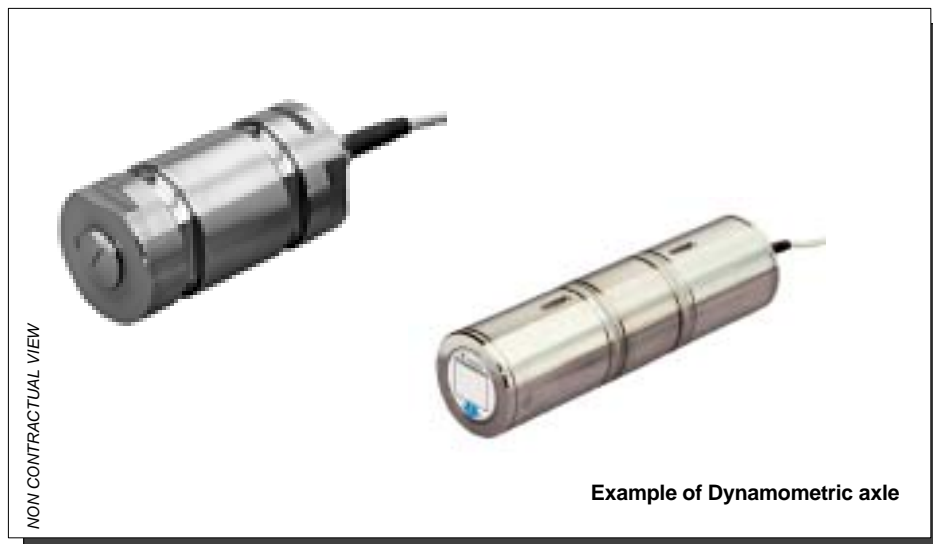
The method is the same, it is only necessary to connect the ground of the receiver and a phase of the transformer with a safety voltmeter (VS) for which the internal impedance is equal to 3kilohms maximum.

The circuit breaker should open instantly.



7.11 DYNAMOMETRIC AXLES

Function / Location	ECL Code	ECL Eqt Code	Ref.
Tapping tool ass'y / Lifting beam ass'y	1-10-109-81	1-10-196-10	KOSD 40 / 100 KN
Tapping tool ass'y / Hook rotation	0-03-244-27	1-10-858-97	Generic Component



1. DESCRIPTION OF THE KOSD 40ECL Code : **1-10-109-81**

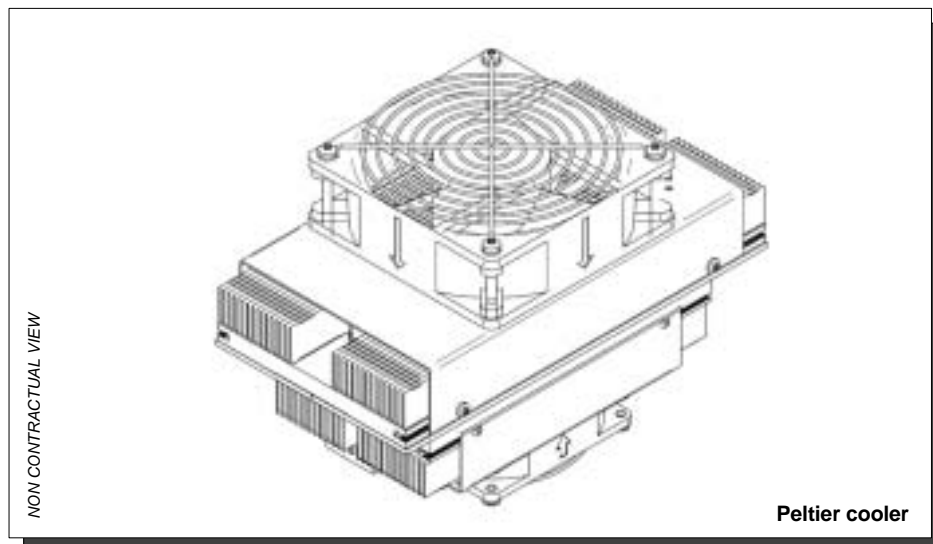
- TYPE : KOSD-40
- MEASURING RANGE: 100kN
- NOMINAL RATING: 1mV/V
- ACCURACY: +/- 1%
- REPEATABILITY: 0,5%
- USING TEMPERATURE: -40 à +80° C
- POWER SUPPLY: 10Vdc or Vac – MAXIMUM 18Vdc or Vac
- ALLOW OVERLOAD WITHOUT DAMAGE: 100% EM
- FAILURE: ABOVE 200% EM
- STEEL: INOX
- CABLE LENGTH: 10m
- PROTECTION: IP67
- SUPPLIER : See manual VISCHAY NOBEL (following pages)

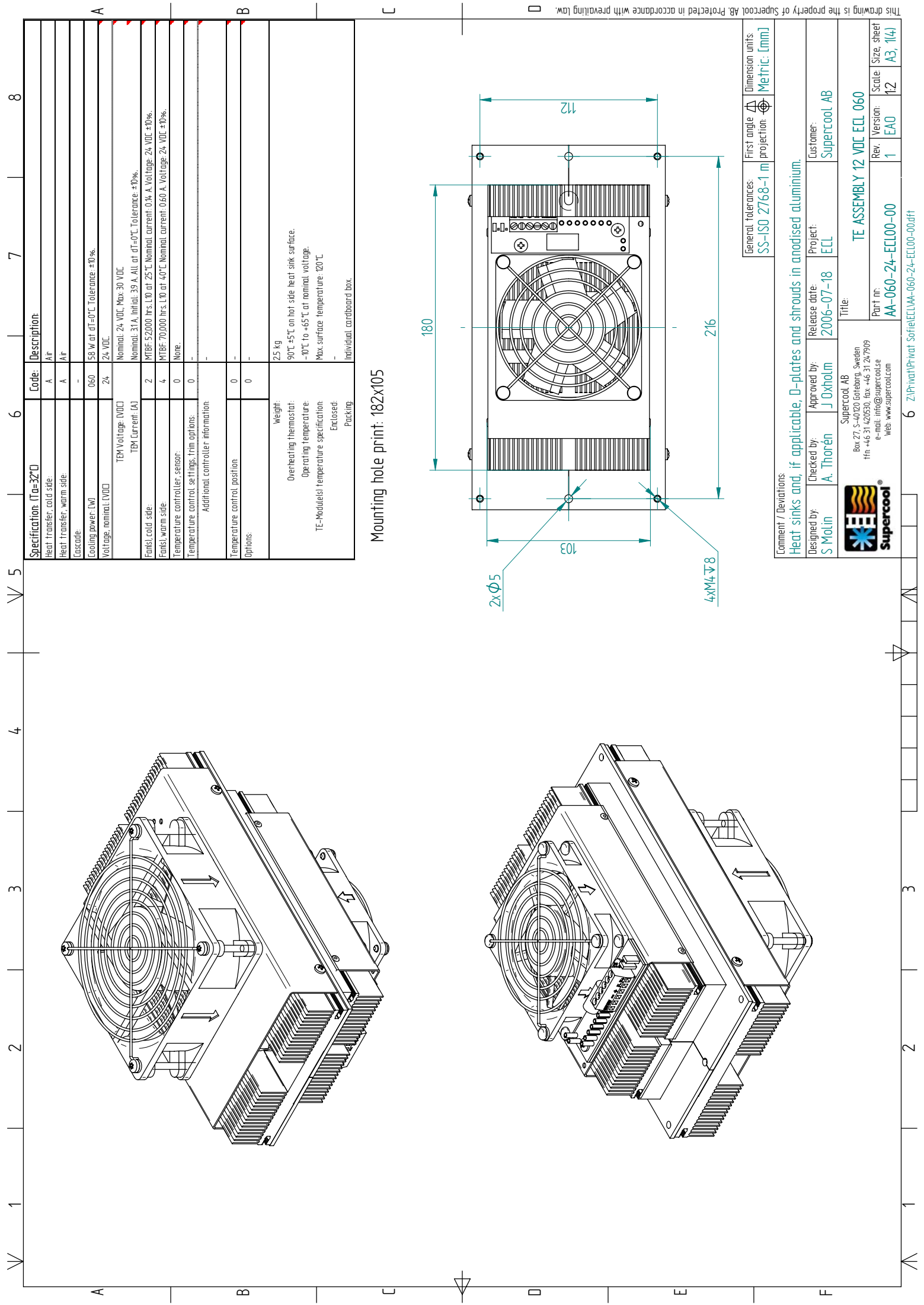
2. DESCRIPTION OF THE GENERIC COMPONENTECL Code : **0-03-244-27**

- Type : DYNANOMETRIC AXLE D.100X360 400 KN
- Rated load : 40 000 daN
- Admissible overload without metrological deterioration : 60 000 daN
- Admissible overload without mechanical destruction : 160 000 daN
- Total precision inf. at 0,1 % of rated load
Nominal sensitiveness : 2 mV/V
- Feed impedance : 350 Ohms
- Feed voltage : 15 V
- Functioning temperature range : -40° at +100° C
- Compensation range in temperature : -25° at +60° C
- Thermal drift of zero : 0,005 % of rated load
- Thermal drift of sensitiveness : 0,005 % of rated load
- Waterproof : IP67
- Treated stainless steel
- Output cable by terminal lenght 5 m
- Reference marks of conductors : V+ Red
..... V- black
..... S+ green
..... S- white
..... R+ blue
..... R- brown

7.12 PELTIER COOLER

Function / Location	ECL Code	Ref.
Trolley framework and cross travel electrical and pneumatical equipment	1-10-108-56	AA-200-24-ECL 00-00





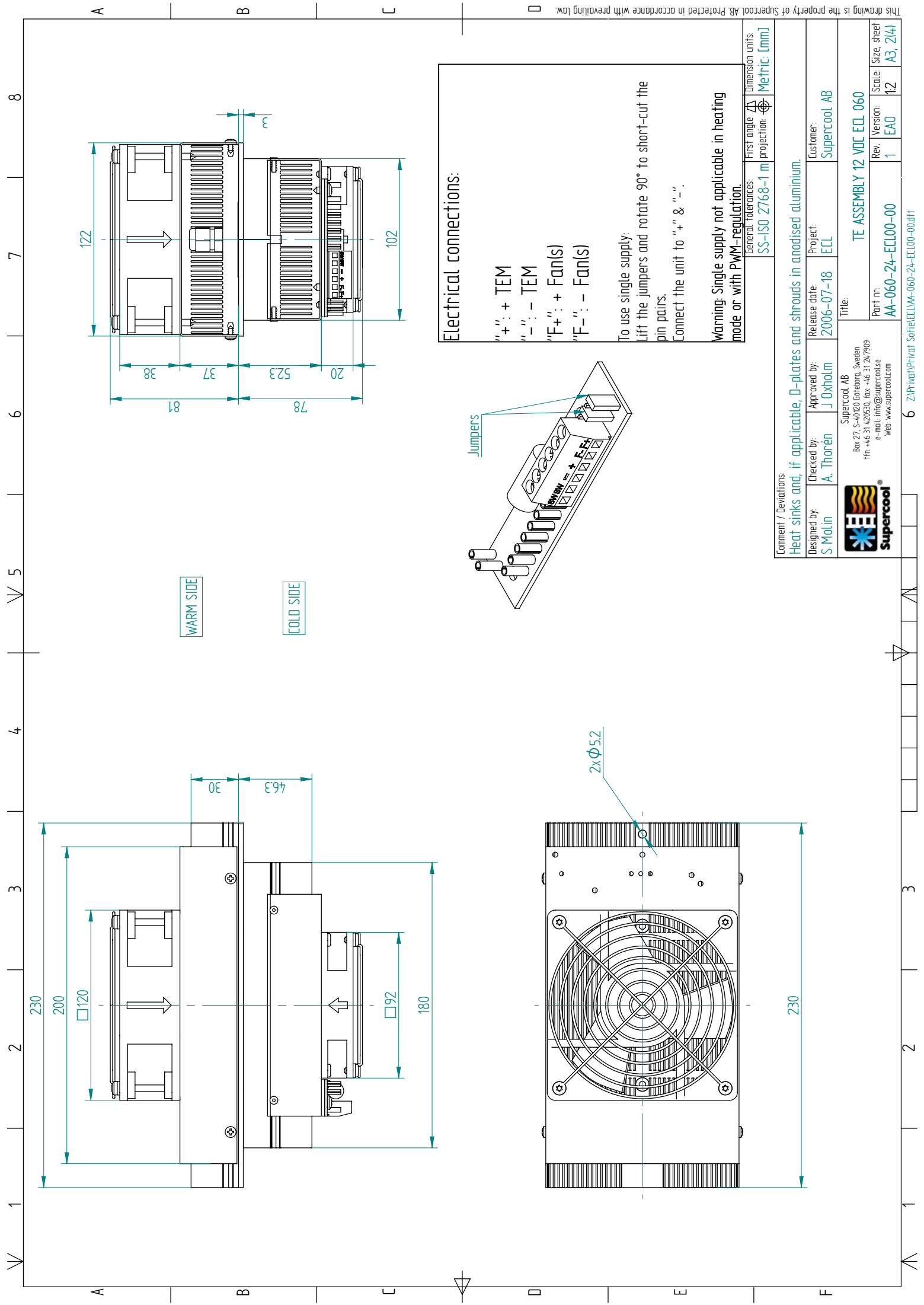
Specification: (Ta=32°C)	Code:	Description:
Heat transfer, cold side:	A	Air
Heat transfer, warm side:	A	Air
Cascade:	-	
Cooling power: [W]	060	58 W at $\Delta T=0^{\circ}\text{C}$. Tolerance: $\pm 10\%$.
Voltage, nominal [VDC]	24	24 VDC.
TEM voltage [VDC]		
TEM current [A]		
Fans, cold side:	2	Nominal: 31 A. Initial: 39 A. All at $\Delta T=0^{\circ}\text{C}$. Tolerance: $\pm 10\%$.
Fans, warm side:	4	MTBF: 52000 hrs. L10 at 25°C : Nominal current 0.14 A. Voltage: 24 VDC $\pm 10\%$.
Temperature controller, sensor:	0	None.
Temperature control settings, trim options:	0	-
Additional controller information:	-	-
Temperature control position:	0	-
Options:	0	-
Weight:		
Overheating thermostat:		
Operating temperature:		
TE-Modules temperature specification:		
Max. surface temperature: 120°C		
Enclosed Packing:		
Individual cardboard box.		

Mounting hole print: 182x105

General tolerances:	First angle projection	Dimension units:
SS-ISO 2768-1 m		Metric: [mm]

Comment / Deviations:			
Heat sinks and, if applicable, D-plates and shrouds in anodised aluminium.			
Designed by:	Checked by:	Approved by:	Release date:
S Molin	A. Thoren	J Oxholm	2006-07-18
Project:			
ECL			
Customer:			
Supercool AB			
Title:			
TE ASSEMBLY 12 VDC ECL 060			
Part nr:			
AA-060-24-ECL00-00			
Rev. Version:			
1 EAO			
Scale:			
12 A3, 1/4			



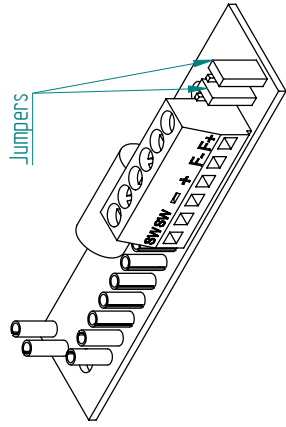


Electrical connections:

" " : + TEM
" " : - TEM
"F+ " : + Fan(s)
"F- " : - Fan(s)

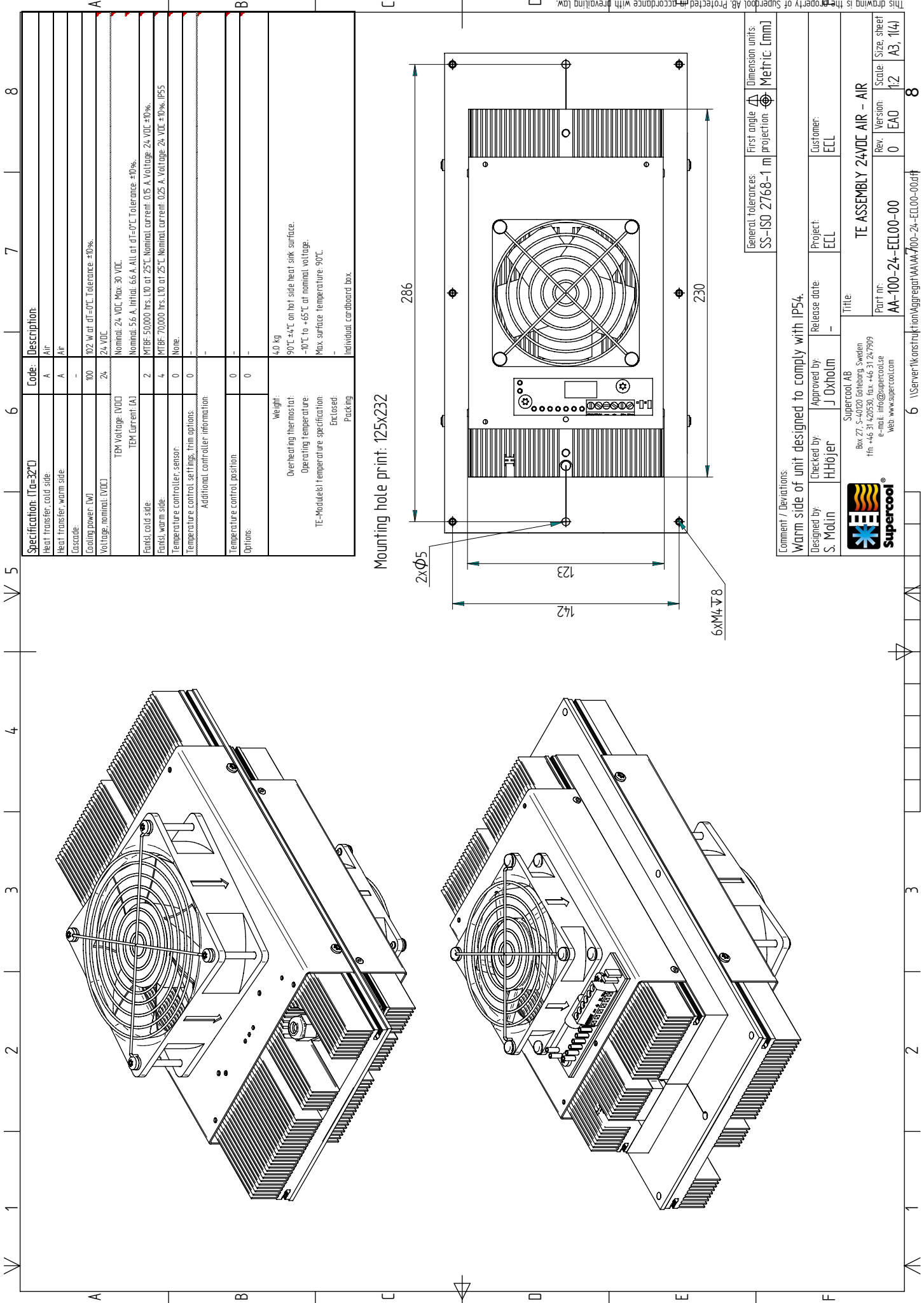
To use single supply:
Lift the jumpers and rotate 90° to short-cut the pin pairs.
Connect the unit to " " & " " .

Warning: Single supply not applicable in heating mode or with PWM-regulation.



Comment / Deviations:							
Heat sinks and, if applicable, D-plates and shrouds in anodised aluminium.							
Designed by:	Checked by:	Approved by:	Release date:	Project:	Customer:		
S Molin	A. Thorén	J Oxholm	2006-07-18	ECL	Supercool AB		
Title:							
 Box 27, S-42020 Göteborg, Sweden tfn +46 31 420530, fax +46 31 72 7909 e-mail: info@supercool.se Web: www.supercool.com				TE ASSEMBLY 12 VDC ECL 060			
Part nr:		Rev.	Version:	Scale	Size, sheet		
AA-060-24-ECL00-00		1	EAO	12	A3, 2(4)		
6				Z:\Privat\Privat Softe\ECL\AA-060-24-ECL00-00.dxf			





Mounting hole print: 125x232

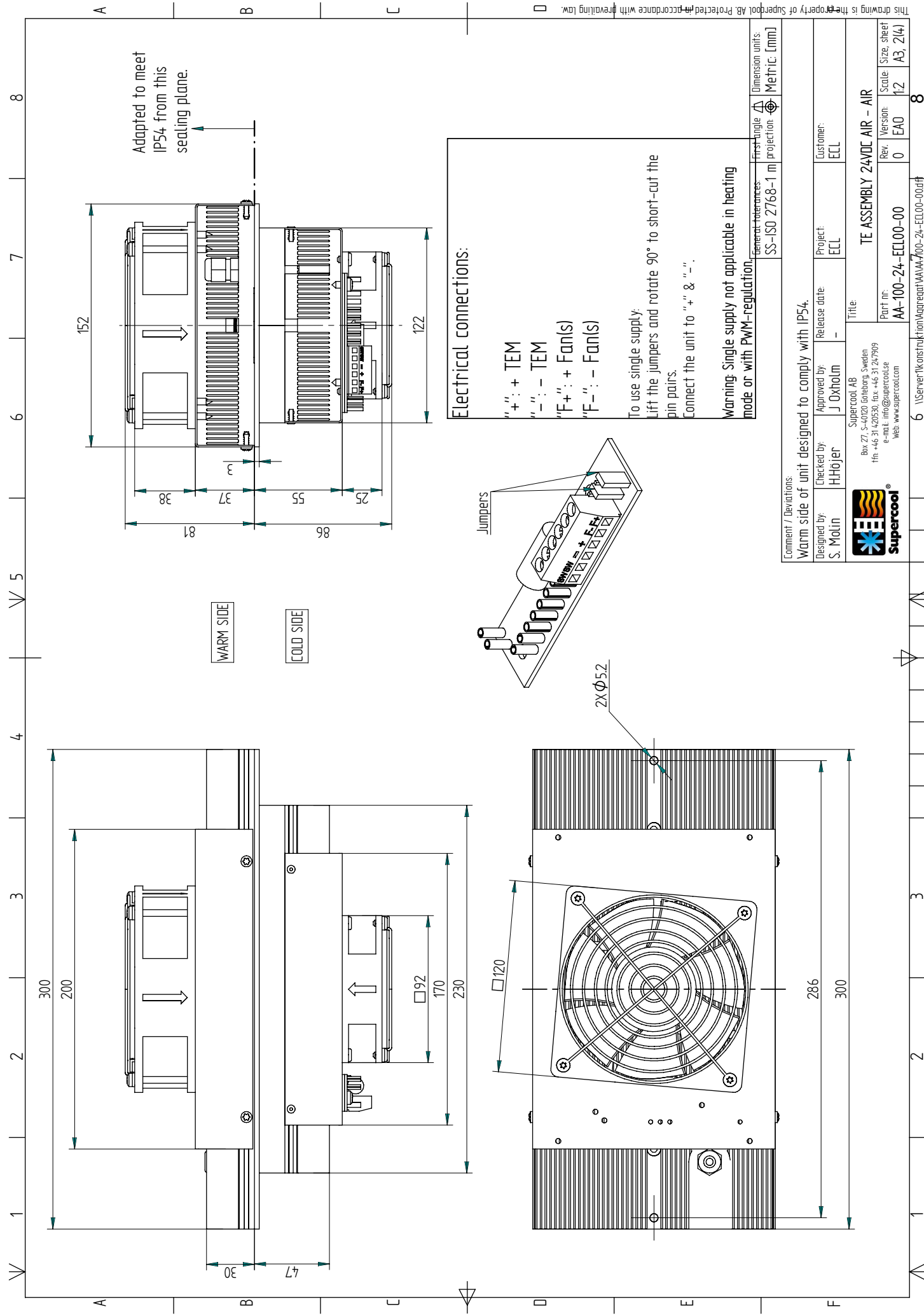
Comment / Deviations:
Warm side of unit designed to comply with IP54.

General Tolerances:	First angle projection	Dimension units:
SS-ISO 2768-1 m		Metric [mm]
Designed by:	Checked by:	Approved by:
S. Molin	H.Hojer	J.Oxholm
Release date:	Project:	Customer:
-	ECL	ECL
Title:		
TE ASSEMBLY 24VDC AIR - AIR		
Part nr:	Rev:	Scale:
AA-100-24-ECL00-00	0	1:2
Size sheet		
A3, 114		



Supercold AB
 Box 271 S-4020 Gäddede, Sweden
 tfn +46 31 420530 fax +46 31 247909
 e-mail: info@supercold.se
 web: www.supercold.com

This drawing is the property of Supercold AB. Protected in accordance with prevailing law.



Comment / Deviations:

Warm side of unit designed to comply with IP54.

Designed by: S. Molin	Checked by: H.Höjer	Approved by: J. Oxholm	Release date: -	Project: ECL	Customer: ECL
Title: TE ASSEMBLY 24VDC AIR - AIR					
Part n°: AA-100-24-ECL00-00			Rev.: 0	Version: EAO	Scale: Size sheet 1:2 A3, 2(4)

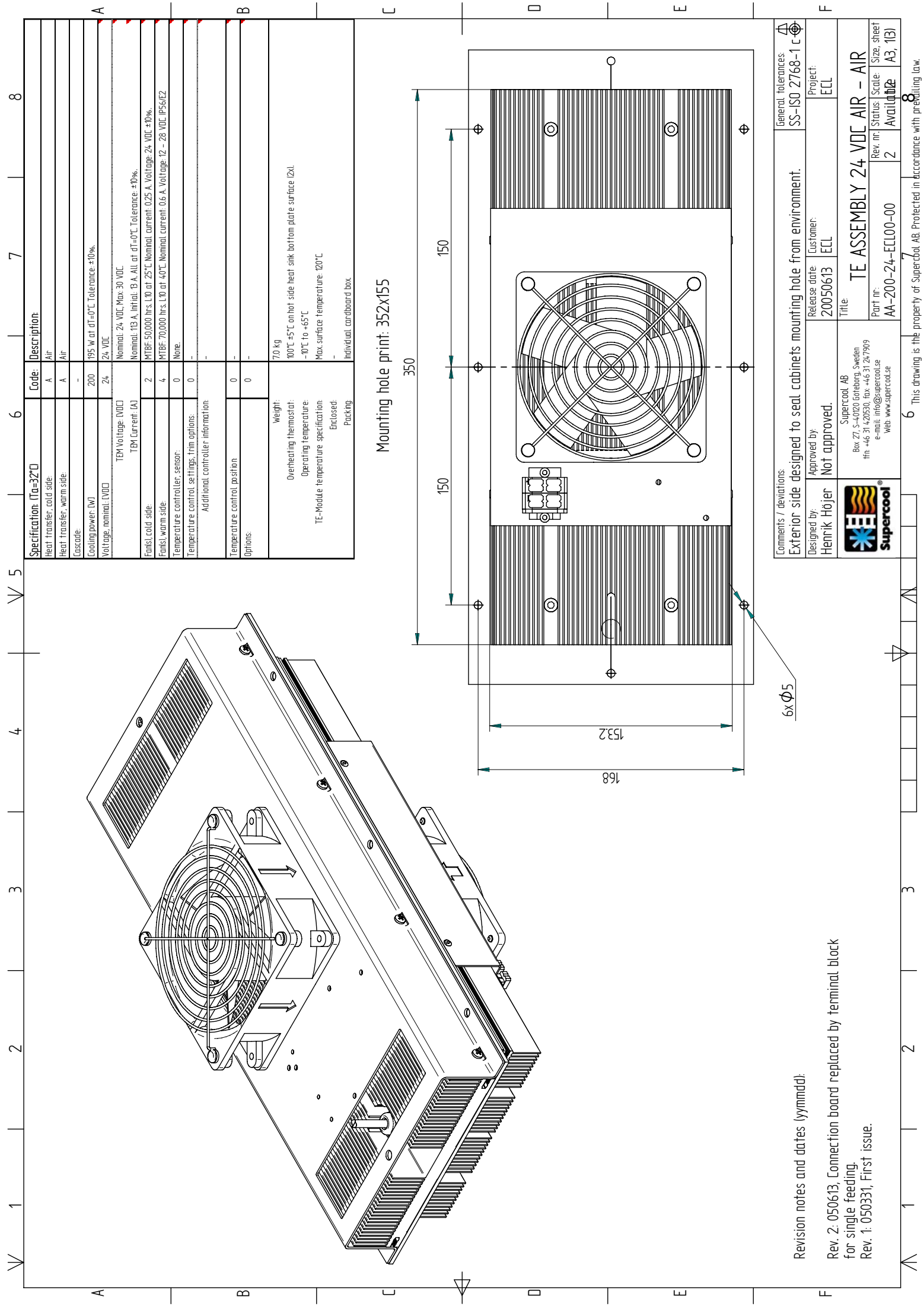


Supercool AB
Box 271 S-40220 Göteborg, Sweden
tfn +46 31 420530 fax +46 31 247909
e-mail: info@supercool.se
web: www.supercool.se

General tolerances:
SS-ISO 2768-1 m

First angle projection

Dimension units:
Metric [mm]



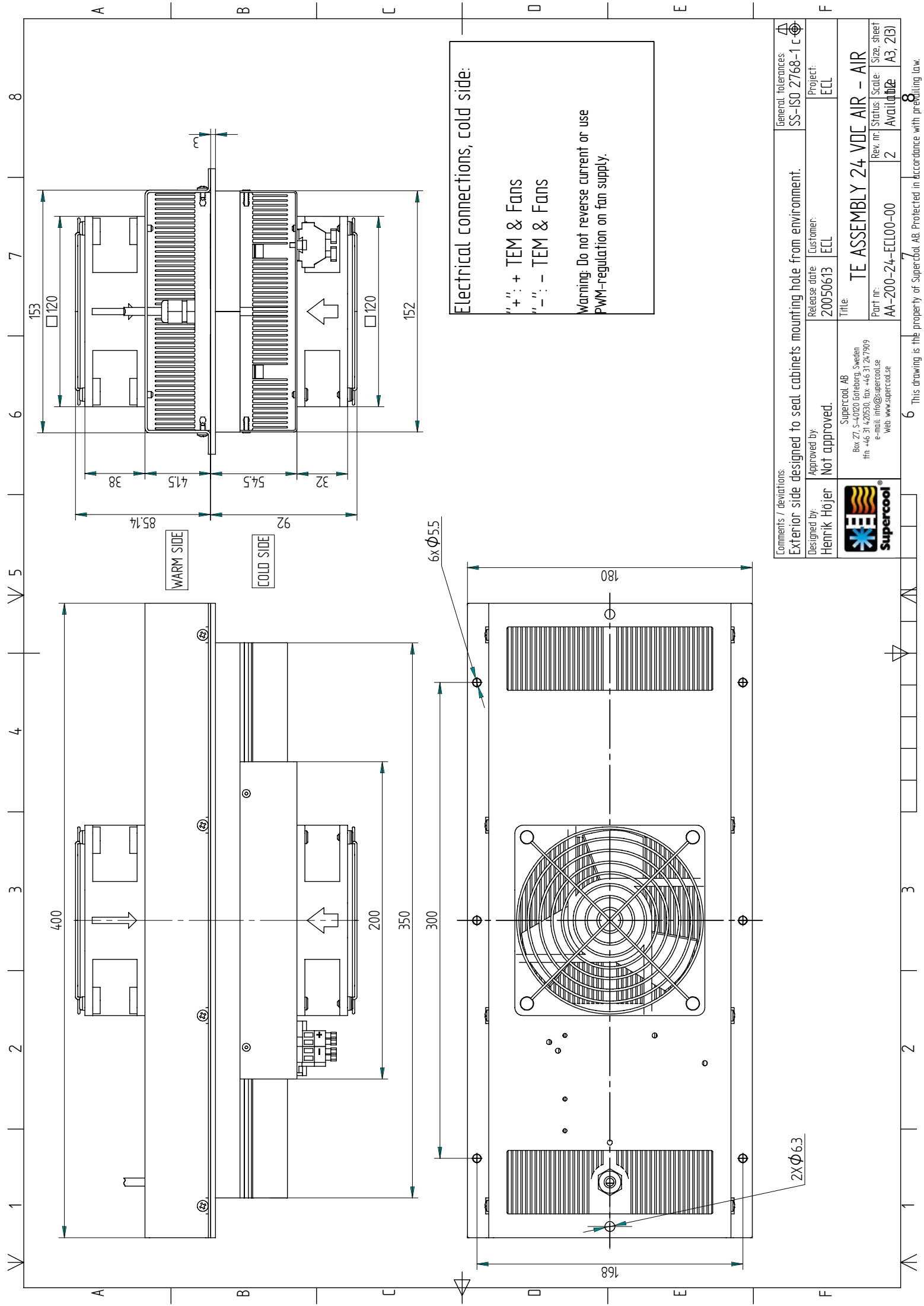
Specification: (Ta=32°C)	Code:	Description:
Heat transfer, cold side	A	Air
Heat transfer, warm side	A	Air
Cascade	-	
Cooling power: (W)	200	195 W at $\Delta T=0^{\circ}\text{C}$ Tolerance $\pm 10\%$.
Voltage, nominal: (VDC)	24	24 VDC
TEM Voltage: (VDC)		Nominal: 24 VDC, Max: 30 VDC
TEM Current: (A)		Nominal: 13 A, Initial: 3 A, All at $\Delta T=0^{\circ}\text{C}$, Tolerance $\pm 10\%$.
Fans, cold side	2	MTBF: 50,000 hrs. L10 at 25°C Nominal current: 0.25 A, Voltage: 24 VDC $\pm 10\%$.
Fans, warm side	4	MTBF: 70,000 hrs. L10 at 40°C Nominal current: 0.6 A, Voltage: 12 ~ 28 VDC, IP56/IE2
Temperature controller, sensor:	0	None.
Temperature control settings, trim options:	0	-
Additional controller information:	-	-
Temperature control position	0	-
Options:	0	-
Weight:		70 kg
Overheating thermostat:		100°C $\pm 5^{\circ}\text{C}$ on hot side heat sink bottom plate surface (2x).
Operating temperature:		-10°C to $+65^{\circ}\text{C}$
TE-Module temperature specification:		Max. surface temperature: 120°C
Enclosed Packing:		-
Individual cardboard box:		-

Mounting hole print: 352x155

Comments / deviations:		General tolerances	
Exterior side designed to seal cabinets mounting hole from environment.		SS-ISO 2768-1 C-M	
Designed by:	Approved by:	Release date:	Customer:
Henrik Höjer	Not approved.	20050613	ECL
Supercool AB Box 27, S-4020 Göteborg, Sweden tfn +46 31 420530, fax +46 31 247909 e-mail: info@supercool.se Web: www.supercool.se		Title	
TE ASSEMBLY 24 VDC AIR - AIR		Project:	
Part nr:		ECL	
Rev. nr:		Scale:	
AA-200-24-ECL00-00		2	
Status:		Size, sheet	
Available		A3, 131	

Revision notes and dates (yyymmdd):

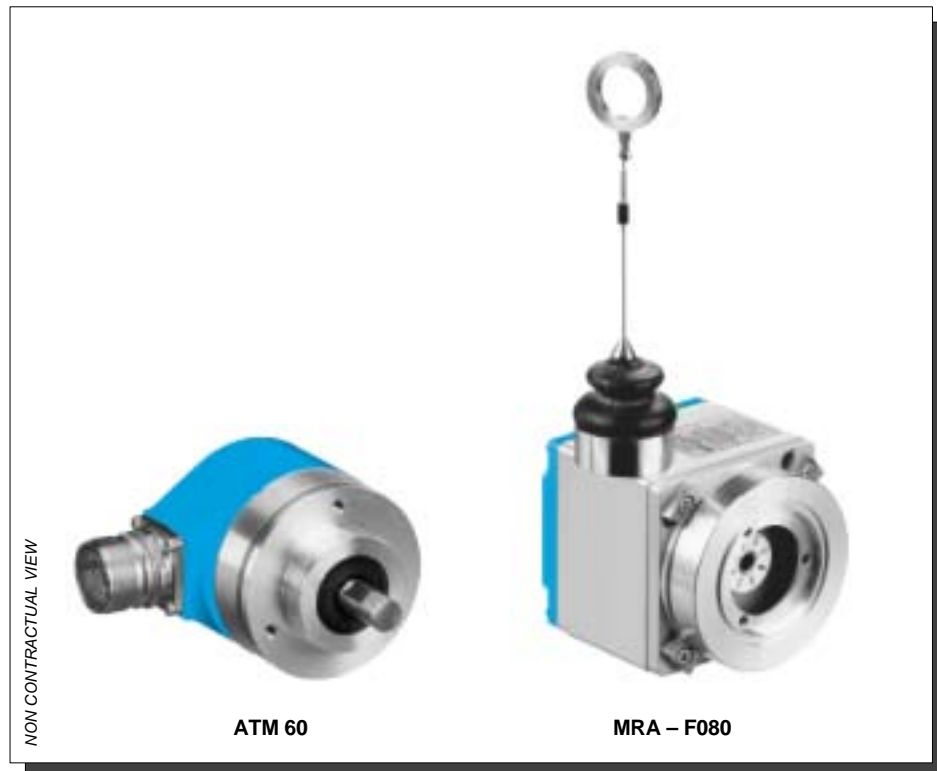
Rev. 2: 050613, Connection board replaced by terminal block for single feeding.
Rev. 1: 050331, First issue.



Comments / deviations:		Exterior side designed to seal cabinets mounting hole from environment.		General tolerances	
Designed by: Henrik Højer		Release date: 20050613		SS-ISO 2768-1 c	
Approved by: Not approved.		Customer: ECL		Project: ECL	
Supercool AB Box 27, S-4020 Göteborg, Sweden tfn +46 31 420530, fax +46 31 247909 e-mail: info@supercool.se Web: www.supercool.se		Title: TE ASSEMBLY 24 VDC AIR - AIR		Part nr: AA-200-24-ECL00-00	
Supercool®		Rev. nr: 2		Status: Available	
				Size, sheet A3, 2B1	

7.13 ENCODER MULTITURN AND WIRE DRAW MECHANISM

Designation	ECL Code	Ref.
Incremental encoder multiturn	1-10-044-78	DRS 60 – EDM01024
Absolute encoder multiturn	1-10-270-02	ATM 60 – D4H13x13
Absolute encoder multiturn	1-10-570-80	ATM 60 – DAH13X13
Suspension mechanism	1-10-105-28	MRA – F080 – 402D2





DRS 61: Incremental encoders, number of lines and zero pulse width freely programmable

DRS 60: Incremental Encoders with Zero-Pulse-Teach



Number of lines
1 up to 8,192
Incremental Encoder

CoreTech[®]
by SICK | STEGMANN

CoreTech technology permits tailor-made solutions for every application, due to its modular design.

With DRS 61 incremental encoders, the number of lines from 1 to 8,192 and the width of the zero pulse can be freely programmed **by the customer**. Therefore, they will be of particular interest to end users, distributors, consulting engineers and system integrators.

DRS 60 incremental encoders are available with any desired number of lines between 1 and 8,192.

Further highlights of this generation of encoders:

- Simple zero-pulse-teach by pressing a button located under a cap on the rear of the encoder
- Excellent price/performance ratio

- Long LED lifetime as a result of automatic light regulation
- Maximum reliability as a result of opto-ASICs with Chip-on-Board technology
- Interchangeable collets for hollow shaft diameters from 6 to 15 mm and 1/4, 3/8, 1/2 inch.

Whether with face mount flange, servo flange, blind or through hollow shaft with connector or cable outlet, TTL or HTL interface – DRS 60/61 encoders will meet virtually any application profile.

Thanks to this wide variety of products, there are numerous possible uses, for example in:

- machine tools
- textile machines
- woodworking machines
- packaging machines

SICK | STEGMANN

DATA SHEET

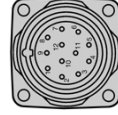
Number of lines
1 up to 8,192
Incremental Encoder

- Connector or cable outlet
- Protection class up to IP 66
- Electrical interfaces TTL and HTL
- Zero-Pulse-Teach via pressing a button
- DRS 61: number of lines and zero pulse width can be freely programmed by the customer



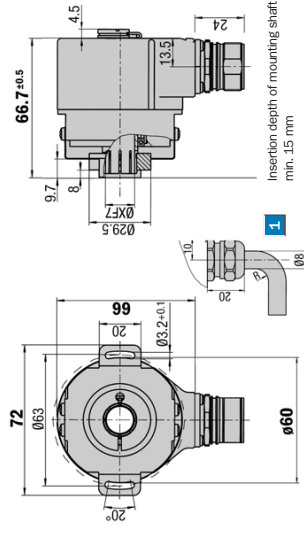
Accessories

Connection systems
Mounting systems
Collets
Programming tool



¹⁾ Potential free to housing
N.C. = Not connected

Dimensional drawing through hollow shaft radial



1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

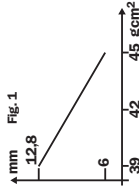
PIN and wire allocation/cable 11 core

PIN	Signal	Wire colour (Cable outlet)	Explanation
1	B	black	Signal line
2	Sense +	grey	Connected internally to U _s
3	Z	lavac	Signal line
4	Z	yellow	Signal line
5	A	white	Signal line
6	A	brown	Signal line
7	N.C.	orange	Not connected
8	B	pink	Signal line
9	Screen		Housing potential
10	GND	blue	Zero volt connected to the encoder
11	Sense -	green	Connected internally to GND
12	U _s	red	Supply voltage ¹⁾

View of the connector M23 fitted to the encoder body

Technical Data to DIN 32878	DRS 60/DRS 61 through hollow shaft	Flange type	through
Hollow shaft diameter	6, 8, 10, 12 mm and 1/4", 3/8", 1/2"		
Number of lines per revolution	00001 up to 08192, see order info		
Electrical Interface	TTL/RS 422, 6-channel HTL/push-pull, 6-channel		
Mass ¹⁾	Approx. 0.3 kg		
Moment of inertia of the rotor	See Fig. 1		
Measuring step	90°/number of lines		
Reference signal			
Number	1		
Position ²⁾	90° or 180°		
Error limits			
binary number of lines	0.035°		
non-binary number of lines	0.046°		
Measuring step deviation			
binary number of lines	0.005°		
non-binary number of lines	0.016°		
Max. output frequency			
TTL	820 kHz		
HTL	200 kHz		
Operating torque max.	3.000 min ⁻¹		
Max. angular acceleration	5 x 10° rad/s ²		
Operating torque	Typ. 1.6 Ncm		
Start up torque	Typ. 2.2 Ncm		
Permissible movement of the drive element			
radial static/dynamic movement	± 0.3/± 0.1 mm		
axial static/dynamic movement	± 0.5/± 0.2 mm		
Bearing lifetime	3.6 x 10 ⁹ revolutions		
Working temperature range	- 20 ... + 85 °C		
Storage temperature range	- 40 ... + 100 °C		
Permissible relative humidity ³⁾	90 %		
EMC ⁴⁾			
Resistance			
to shocks ⁵⁾	5/11 g/ms		
to vibration ⁶⁾	20/10 ... 2000 g/Hz		
Protection class IEC 60529			
Connector outlet ⁷⁾	IP 64		
Cable outlet	IP 64		
Operating voltage range			
Load current TTL/RS 422, 4.5 ... 5.5 V	Max. 20 mA		
HTL/push-pull, 10 ... 32 V	Max. 60 mA		
No-load operating current			
at 10 ... 32 V	Typ. 100 mA		
at 5 V	Typ. 120 mA		
Operation of zero-set ⁸⁾	≥ 100 ms		
Initialisation time after power on	40 ms		

1) Concerning encoder with connector
2) Electrical, logically linked to A and B
3) Condensation of the optical scanning not permitted
4) To DIN EN 61000-6-2 and DIN EN 61000-6-2
5) To DIN EN 60068-2-27
6) To DIN EN 60068-2-6
7) With mating connector fitted
8) Only with shaft stationary



Number of lines
1 up to 8,192

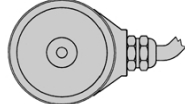
Incremental Encoder

- Connector or cable outlet
- Protection class up to IP 66
- Electrical interfaces
TTL and HTL
- Zero-Pulse-Teach via
pressing a button
- DRS 61: number of lines and
zero pulse width can be freely
programmed by the customer



Electrical interface	4.5 ... 5.5 V	10 ... 32 V	10 ... 32 V
Supply voltage	TTL (RS 422)	TTL (RS 422)	HTL (push-pull)
Interfaces/drivers			

Connection type	Connector radial
Cable radial	



Accessories
Connection systems
Mounting systems
Collets
Programming tool

Order information

Incremental Encoder DRS 60, through hollow shaft

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14
D	R	S	6	0	-		D						
Number of lines													
Each number of lines from 00001 up to 08192 possible. Always 5 characters in clear text.													
Connection type													
Connector M23, 12 pin, radial = A													
Cable 11 core, radial 1.5 m = K													
Cable 11 core, radial 3 m = L													
Cable 11 core, radial 5 m = M													
Cable 11 core, radial 10 m = N													
Mechanical interface													
Through hollow shaft ¹⁾ = D													
¹⁾ Collets for 6, 8, 10, 12 mm and 1/4", 3/8" and 1/2" as accessories, separate order item (see below).													
Electrical interface													
4.5 ... 5.5 V, TTL/RS 422 = A													
Zero-pulse width 90° = B													
10 ... 32 V, TTL/RS 422 = C													
Zero-pulse width 90° = D													
Zero-pulse width 180° = E													
10 ... 32 V, HTL/push-pull = F													
Zero-pulse width 180° = F													

Order example Incremental Encoder DRS 60

4.5 ... 5.5 V, TTL/RS 422 zero-pulse width 90°; through hollow shaft; connector M23, 12 pin, radial; number of lines: 360													
Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14
D	R	S	6	0	-	A	D	A	0	0	3	6	0



Incremental-Encoder DRS 61 through hollow shaft (number of lines and zero pulse width can be freely programmed by the customer)

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14
D	R	S	6	1	-		D		0	8	1	9	2
Number of lines													
Factory-programmed to 8192.													
Connection type													
Connector M23, 12 pin, radial = A													
Cable 11 core, radial 1.5 m = K													
Mechanical interface													
Through hollow shaft ¹⁾ = D													
¹⁾ Collets for 6, 8, 10, 12 mm and 1/4", 3/8" and 1/2" as accessories, separate order item (see below).													
Electrical interface													
4.5 ... 5.5 V, TTL/RS 422 = A													
10 ... 32 V, TTL/RS 422 = C													
10 ... 32 V, HTL/push-pull = E													

Order example Incremental Encoder DRS 61

4.5 ... 5.5 Volt, TTL/RS 422; through hollow shaft; connector M23, 12 pin, radial; number of lines: 8192 (factory-programmed)													
Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14
D	R	S	6	1	-	A	D	A	0	8	1	9	2

Through hollow shaft collets

Type	Part no.	Shaft diameter
SPZ-006-AD-D	2 029 192	6 mm
SPZ-1E4-AD-D	2 029 193	1/4"
SPZ-008-AD-D	2 029 194	8 mm
SPZ-3E8-AD-D	2 029 195	3/8"
SPZ-010-AD-D	2 029 196	10 mm
SPZ-012-AD-D	2 029 197	12 mm
SPZ-1E2-AD-D	2 029 198	1/2"

Dimensional drawings and order information

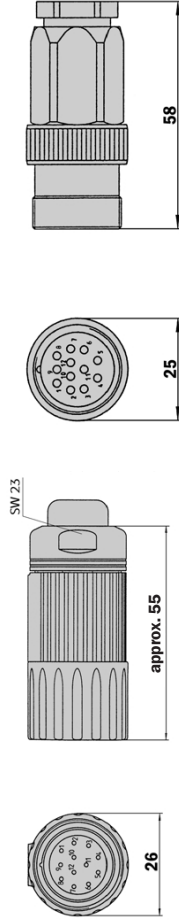
Programming Tool for DRS 61

Type	Part no.
PGT-04-S	1 034 930

Screw-in system M23, 12 pin

Type	Part no.	Contacts
Cable connector M23 female, 12 pin, straight, screened	DOS-2312-G	12

Type	Part no.	Contacts
Cable connector M23, 12 pin, straight, screened	STE-2312-G	12



Connector M23 female, 12 pin, straight, cable 12 cores, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² with screening, capable of being dragged, cable diameter 78 mm

Type	Part no.	Contacts	Cable length
DOL-2312-G1M5MA3	2 029 212	12	1.5 m
DOL-2312-G03MMA3	2 029 213	12	3.0 m
DOL-2312-G05MMA3	2 029 214	12	5.0 m
DOL-2312-G10MMA3	2 029 215	12	10.0 m
DOL-2312-G20MMA3	2 029 216	12	20.0 m
DOL-2312-G30MMA3	2 029 217	12	30.0 m

Cable 8 core, per meter, 4 x 2 x 0.15 mm² with screening, cable diameter 5.6 mm

Type	Part no.	Wires
LTG-2308-MWENC	6 027 529	8

Cable 11 core, per meter, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screening, cable diameter 7.5 mm

Type	Part no.	Wires
LTG-2411-MW	6 027 530	11

Cable 12 core, per meter, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² with screening, capable of being dragged, cable diameter 7.8 mm

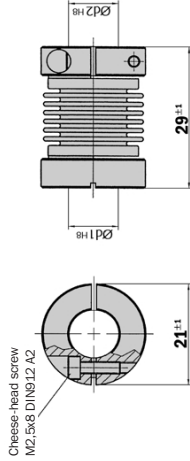
Type	Part no.	Wires	Explanation
LTG-2512-MW	6 027 531	12	
LTG-2612-MW	6 028 516	12	UV and salt water resistant

Dimensional drawings and order information

Couplings

Bellows coupling, max. shaft offset radial ± 0.3 mm, axial 0.4 mm, angle ± 4 degrees, torsion spring stiffness 120 Nm/rad,

Type	Part no.	Shaft diameter
KUP-0606-B	5 312 981	6 mm ... 6 mm
KUP-0610-B	5 312 982	6 mm ... 10 mm
KUP-1010-B	5 312 983	10 mm ... 10 mm
KUP-1012-B	5 312 984	10 mm ... 12 mm



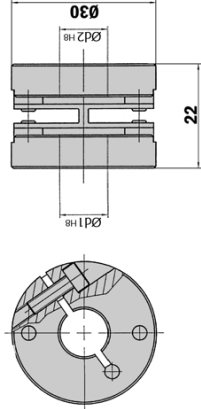
Cheese-head screw

M2,5x8 DIN912 A2

Spring-disc coupling, max. shaft offset radial ± 0.3 mm, axial 0.4 mm, angle ± 2.5 degrees, torsion spring stiffness 50 Nm/rad,

flange of aluminium, spring-discs of glass-fibre-reinforced plastic

Type	Part no.	Shaft diameter
KUP-0610-F	5 312 985	6 mm ... 10 mm
KUP-1010-F	5 312 986	10 mm ... 10 mm



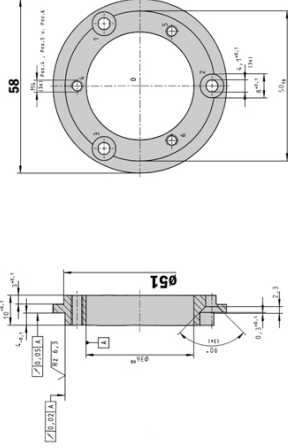
General tolerances according to DIN ISO 2768-mk

Dimensional drawings and order information

Mechanical Adaptors

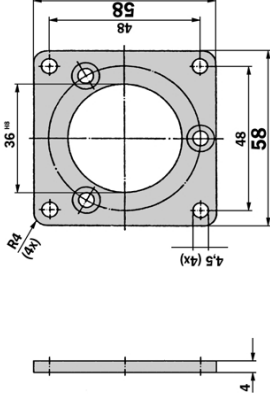
Adaptor flange of aluminium for face mount flange, spigot 36 mm

Type	Part no.	Adaption
BEF-FA-036-050	2 029 160	To 50 mm servo flange



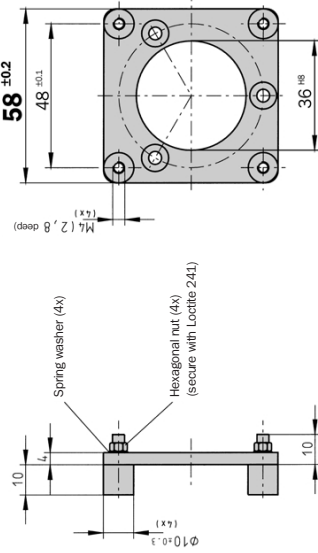
Adaptor flange of aluminium for face mount flange, spigot 36 mm

Type	Part no.	Adaption
BEF-FA-036-060REC	2 029 162	To 60 mm square mounting plate



Adaptor flange of aluminium for face mount flange, spigot 36 mm

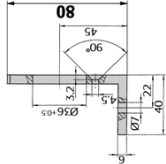
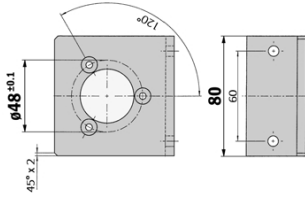
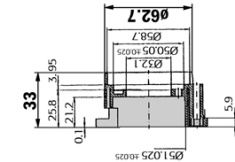
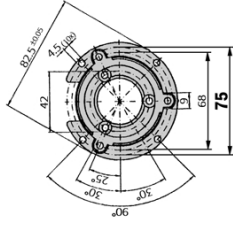
Type	Part no.	Adaption
BEF-FA-036-060RSA	2 029 163	To 60 mm square mounting plate with shock absorbers



Dimensional drawings and order information

Mechanical Adaptors

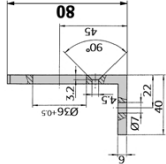
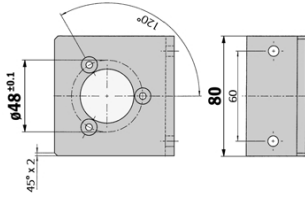
Mounting bell incl. fixing set for encoder with servo flange		
Type	Part no.	Flange spigot
BEF-MG-50	5 312 987	Diameter 50 mm



Dimensional drawings and order information

Mechanical Adaptors

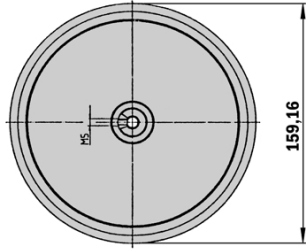
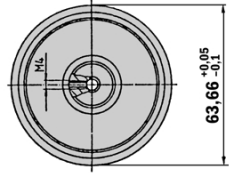
Mounting angle incl. fixing set for encoder with face mount flange		
Type	Part no.	Flange spigot
BEF-WF-36	2 029 164	Diameter 36 mm



Dimensional drawings and order information

Mechanical Adaptors

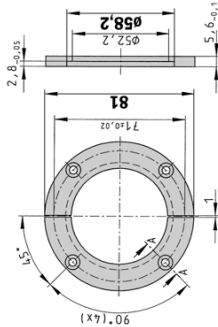
Measuring wheel for encoder shafts with diameter 10 mm, type material plastic (Hytrek), wheel material plastic with aluminium hub		
Type	Part no.	Circumference
BEF-MR-010020	5 312 988	0.2 m



Measuring wheel for encoder shafts with diameter 10 mm, type material plastic (Hytrek), wheel material plastic with aluminium hub		
Type	Part no.	Circumference
BEF-MR-010050	5 312 989	0.5 m

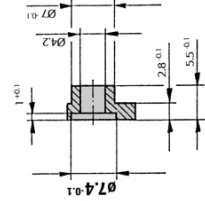
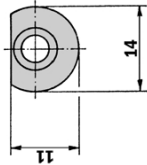
Servo clamps half ring, Set (comprises 2 pieces) for servo flanges with spigot diameter 50 mm

Type	Part no.
BEF-WG-SF050	2 029 165



Servo clamps small, Set (comprises 3 pieces) for servo flanges

Type	Part no.
BEF-WK-SF	2 029 166



Collets

Collets for blind hollow shaft encoder		
Type	Part no.	Shaft diameter
SPZ-006-AD-A	2 029 174	6 mm
SPZ-1E4-AD-A	2 029 175	1/4"
SPZ-008-AD-A	2 029 176	8 mm
SPZ-3E8-AD-A	2 029 177	3/8"
SPZ-010-AD-A	2 029 178	10 mm
SPZ-012-AD-A	2 029 179	12 mm
SPZ-1E2-AD-A	2 029 180	1/2"

Collets for through hollow shaft encoder		
Type	Part no.	Shaft diameter
SPZ-006-AD-D	2 029 192	6 mm
SPZ-1E4-AD-D	2 029 193	1/4"
SPZ-008-AD-D	2 029 194	8 mm
SPZ-3E8-AD-D	2 029 195	3/8"
SPZ-010-AD-D	2 029 196	10 mm
SPZ-012-AD-D	2 029 197	12 mm
SPZ-1E2-AD-D	2 029 198	1/2"



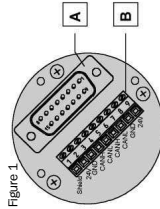
- Extremely robust
- Bus coupling to CAN-High speed
- Electronically adjustable, resolution adjustable
- Highly shock- and vibration-proof
- High degree of protection IP 67



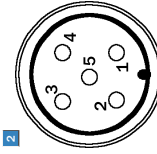
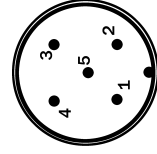
1 Encoders with a DeviceNet adaptor have a terminal strip for connecting the bus and supply lines. In order to connect the lines, the DeviceNet adaptor is unscrewed from the complete device. The figure 1 shows the pin allocation within the bus connection.

Accessories

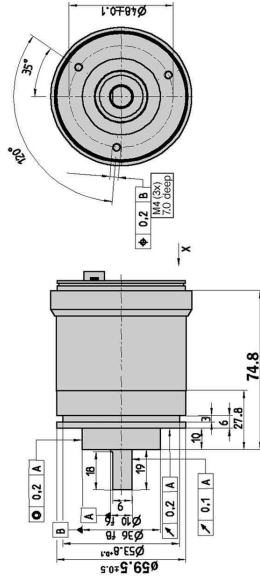
Bus adaptor
Mounting systems



A Internal plug connection to the encoder
B External connection to the bus

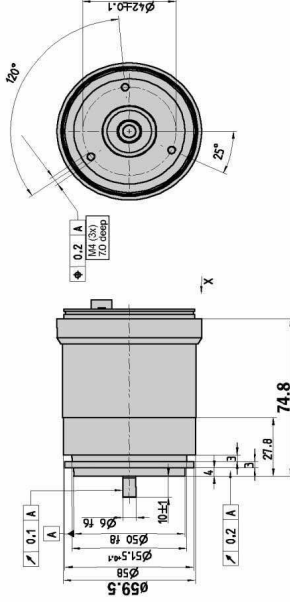
OUT/ U_s (female)IN/ U_S (male)

Dimensional drawing face mount flange



General tolerances according DIN ISO 2768-mk

Dimensional drawing servo flange



General tolerances according DIN ISO 2768-mk

1 PIN and wire allocation for bus adaptor

Terminal strip	2	Connector	Signal	Explanation
1	1		Shield	Screen
2	2		U _s (24 V)	Supply voltage 10 ... 32 V
3	3		GND (COM)	0V (Gnd)
4	4		CAN _{Hi}	CAN Bus Signal HIGH
5	5		CAN _L	CAN Bus Signal LOW
6	6		CAN _{Hi}	CAN Bus Signal HIGH
7	7		CAN _L	CAN Bus Signal LOW
8	8		GND (COM)	0V (Gnd)
9	9		U _s (24 V)	Supply voltage 10 ... 32 V

Figure 3

28 SICK-STEGMANN

SICK-STEGMANN 29

Technical data according to DIN 32878 ATM 60 DeviceNet

Technical data according to DIN 32878		ATM 60 DeviceNet		Flange type	
		face m)	servo		
Solid shaft	10 mm				
	6 mm				
Mass	Approx. 0.59 kg				
Moment of inertia of the rotor	35 gcm ²				
Measuring step	0.043°				
Max. number of steps per revolution	8.192				
Max. number of revolutions	8.192				
Error limits	± 0.25°				
Repeatability	0.1°				
Operating speed	6.000 min ⁻¹				
Position forming time	0.25 ms				
Max. angular acceleration	5 x 10 ⁵ rad/s ²				
Operating torque	1.8 Nm ³⁾				
	without shaft seal ³⁾				
Start up torque	0.3 Nm				
	2.5 Nm ³⁾				
	without shaft seal ²⁾				
Max. shaft loading	0.5 Nm				
radial	300 N				
axial	50 N				
Bearing lifetime	3.6 x 10 ⁹ revolutions				
Working temperature range	- 20 ... + 80 °C				
Storage temperature range	- 40 ... + 125 °C				
Permissible relative humidity	98 %				
EMC ³⁾					
Resistance					
	to shocks ⁴⁾				
	to vibration ⁵⁾				
Protection class acc. IEC 60529	20/10 ... 2000 g/Hz				
	with shaft seal				
	IP 67				
	without shaft seal ⁶⁾				
	IP 43				
	without shaft seal ⁷⁾				
	IP 66				
Operating voltage range (Us)	10 ... 32 V				
Power consumption	2.0 W				
Initialisation time ⁸⁾	1250 ms				
Bus Interface DeviceNet					
Electrical interface ⁹⁾	ISO-DIS 11898				
Protocol	DeviceNet Specification, Release 2.0				
Address setting (NODE ID)	0 ... 63 (DIP switches or protocol)				
Data transmission rate (Data Rate)	(125, 250, 500) kB				
	(DIP switches or protocol)				
Electronic adjustment (Number SET)	Via PRESET push button or protocol				
Status Information	Network Status LED (NS), 2 colours				
Bus Termination ¹⁰⁾	Via DIP switches				
Electrical Connection	Bus adaptor ¹¹⁾				

Order information

Type	Part no.	Explanation
ATM60-D4H13X13	1 030 017	Face mount solid shaft Ø 10 mm
ATM60-D1H13X13	1 030 018	Servo flange solid shaft Ø 6 mm

Attention: Please order the DeviceNet adapter separately (see page 32)

- 1) With shaft seal
- 2) In case that shaft seal has been removed by customer
- 3) To DIN EN 61009-6-2 and DIN EN 61009-6-3
- 4) To DIN EN 61009-2-27
- 5) To DIN EN 60668-2-6
- 6) Not sealed at encoder flange
- 7) Sealed at encoder flange
- 8) From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.
(CAN High Speed) and CAN Specification 2.0 B, DC isolated
- 10) Should only be connected in the final device
- 11) For cable with PG 9 or connector (see bus adaptor)

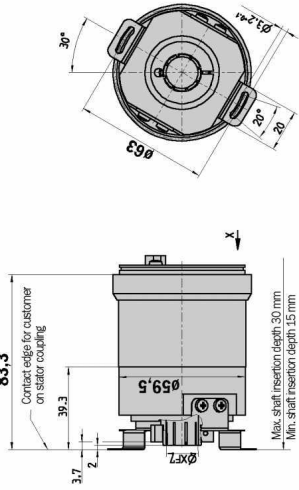


Resolution
up to 26 bits

Absolute Encoder Multiturn

- Extremely robust
- Bus coupling to CAN-High speed specification
- Electronically adjustable, resolution adjustable
- Highly shock- and vibration-proof
- High degree of protection IP 67

Dimensional drawing blind hollow shaft

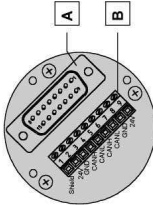


General tolerances according DIN ISO 2768-mk

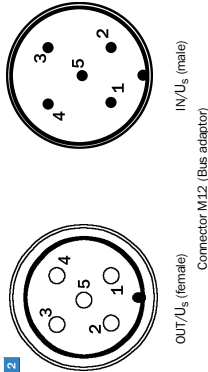
1 PIN and wire allocation for bus adaptor

Terminal strip	2	Connector	Signal	Explanation
1	1	Shield	Screen	
2	2	U _S (24V)	Supply voltage 10 ... 32 V	
3	3	GND (COM)	0V (Gnd)	
4	4	CAN _H	CAN Bus Signal HIGH	
5	5	CAN _L	CAN Bus Signal LOW	
6	6	CAN _H	CAN Bus Signal HIGH	
7	7	CAN _L	CAN Bus Signal LOW	
8	8	GND (COM)	0V (Gnd)	
9	9	U _S (24V)	Supply voltage 10 ... 32 V	

1 Encoders with a DeviceNet adaptor have a terminal strip for connecting the bus and supply lines. In order to connect the lines, the DeviceNet adaptor is unscrewed from the complete device. The figure shows the pin allocation within the bus connection.



A Internal plug connection to the encoder
B External connection to the bus



Accessories
Bus adaptor
Collets

Technical data according to DIN 32678	ATM 60 DeviceNet	Flange type
		blind

1 Hollow shaft diameter	6, 8, 10, 12, 15 mm, 1/4", 3/8", 1/2"	
Mass	Approx. 0.59 kg	
Moment of inertia of the rotor	55 gcm ²	
Measuring step	0.043°	
Max. number of steps per revolution	8,192	
Max. number of revolutions	8,192	
Error limits	± 0.25°	
Repeatability	0.1°	
Operating speed	3,000 min ⁻¹	
Position forming time	0.25 ms	
Max. angular acceleration	5 x 10 ⁵ rad/s ²	
Operating torque	0.8 Ncm ³⁾	
Start up torque	1.2 Ncm ³⁾	
Permissible shaft movement		
of the drive element		
radial static/dynamic	± 0.3/± 0.1 mm	
axial static/dynamic	± 0.5/± 0.2 mm	
Bearing lifetime	3.6 x 10 ⁶ revolutions	
Working temperature range	- 20 ... + 80 °C	
Storage temperature range	- 40 ... + 125 °C	
Permissible relative humidity	98 %	
EMC ²⁾		
Resistance		
to shocks ³⁾	100/6 g/ms	
to vibration ⁴⁾	20 / 10 ... 2000 g/Hz	
Protection class acc. IEC 60529 ³⁾	IP 67	
without shaft seal ⁵⁾	IP 43	
Operating voltage range (U _S)	10 ... 32 V	
Power consumption	2.0 W	
Initialisation time ⁶⁾	1250 ms	
Bus Interface DeviceNet		
Electrical Interface ⁷⁾	ISO-DIS 11898	
Protocol	DeviceNet Specification, Release 2.0	
Address setting (NODE ID)	0 ... 63 (DIP switches or protocol)	
Data transmission rate (Data Rate)	(125, 250, 500) kB (DIP switches or protocol)	
Electronic adjustment (Number SET)	Via PRESET push button or protocol	
Status Information	Network Status LED (NS), 2-colours	
Bus Termination ⁸⁾	Via DIP switches	
Electrical Connection	Bus adaptor ⁹⁾	

Order Information		
ATM 60 DeviceNet blind hollow shaft; U _S 10 ... 32 V		
Type	Part no.	Explanation
ATM60-DAH13X13	1 030 019	Blind hollow shaft
Attention: Please order the DeviceNet adaptor separately (see page 32)		

1 Attention: Please order the collet with required diameter separately		
Type	Part no.	Shaft diameter
SPZ-006-AD-A	2 029 174	6 mm
SPZ-1E4-AD-A	2 029 175	1/4"
SPZ-008-AD-A	2 029 176	8 mm
SPZ-3E8-AD-A	2 029 177	3/8"
SPZ-010-AD-A	2 029 178	10 mm
SPZ-012-AD-A	2 029 179	12 mm
SPZ-1E2-AD-A	2 029 180	1/2"
For 15 mm shaft diameter, collet is not needed		

- ¹⁾ With shaft seal
- ²⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3
- ³⁾ To DIN EN 60068-2-27
- ⁴⁾ To DIN EN 60068-2-6
- ⁵⁾ Not sealed at encoder flange
- ⁶⁾ From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in
- ⁷⁾ (CAN High Speed) and CAN Specification 2.0 B, DC isolated
- ⁸⁾ Should only be connected in the final device
- ⁹⁾ For cable with PG 9 or connector (see bus adaptor)

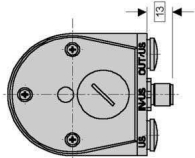


- Extremely robust
- Bus coupling to CAN-High speed specification
- Electronically adjustable, resolution adjustable
- Highly shock- and vibration-proof
- High degree of protection IP 67



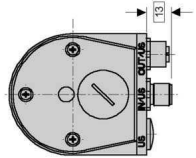
Accessories
Connection systems

Dimensional drawing DeviceNet adaptor SR1



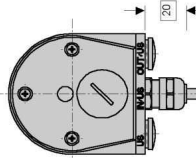
General tolerances according DIN ISO 2768-mK

Dimensional drawing DeviceNet adaptor SR2



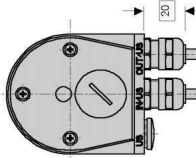
General tolerances according DIN ISO 2768-mK

Dimensional drawing DeviceNet adaptor KR1



General tolerances according DIN ISO 2768-mK

Dimensional drawing DeviceNet adaptor KR2

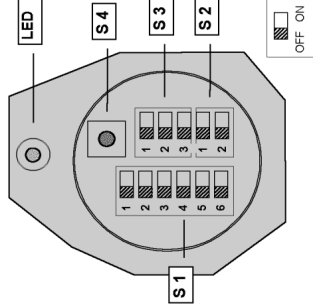


General tolerances according DIN ISO 2768-mK

Order information

ATM 60 DeviceNet adaptor		
Type	Part no.	Explanation
AD-ATM60-SR1DN	2 029 226	Bus adaptor SR1, 1 x M12, 5 pin
AD-ATM60-SR2DN	2 029 227	Bus adaptor SR2, 2 x M12, 5 pin
AD-ATM60-KR1DN	2 029 228	Bus adaptor KR1, 1 x PG
AD-ATM60-KR2DN	2 029 229	Bus adaptor KR2, 2 x PG

Switch settings



Switch settings

Access to the switches is gained by opening the removable screw cap (PG) on the rear of the bus adaptor. Use of the following elements.

- S 1 Address setting (Node ID)
- S 2 Bus termination
- S 3 Baud rate setting (Data Rate)
- S 4 Preset push button (Number zero SET)

Status information (NS) via LED

- LED 2-colour red/green
- Network communication status

Implementation

DN Functionality

- Object model
- Identity Object
- Message Router Object
- DeviceNet Object
- Assembly Object
- Connection Object
- Acknowledge Handler Object
- Encoder Object

I/O-Operating Modes

- Polling
- Change of State/Cyclic
- Bits Strobe

Encoder Parameters

according the Device Profile for Encoders:

- Code direction (CW, CCW)
- Scaling function (ON, OFF)
- PRESET value
- Hysteresis to position change of required for COS communication
- Steps per revolution (CPR) - 1 ... 8,192
- Total resolution (TR) - 1 ... 67,108,864 steps, with TR = 2ⁿ x CPR -- (n=0 ... 13)
- Limits for the working range (software limit switches)
- Limits and display format for the speed and acceleration values
- 8 programmable cams with HIGH/LOW limits and hysteresis
- General Diagnostic parameters (Offset Value, Alarms, Warnings, version of profile and software)

Manufacturer specific parameters:

- Assignment of the I/O Data Assembly to the different I/O operating modes
- Diagnostic data indicating the current maximum results of the encoder
- Device-specific data

I/O Data Assembly

- 1) Pos Val (Position Value) 1-1
- 2) Pos Val + Flag 1-1, 1-2
- 3) Pos Val + Speed 1-1, 1-3
- 4) Pos Val + Status of Cam 1-1, 1-4

Input Data Objects

- 1-1 Position value [Pos Val] 4 Byte
- 1-2 Flag (Alarm, Warning) 1 Byte
- 1-3 Speed 4 Byte
- 1-4 Status of cam 1 Byte

Setting: - Address (Node ID)

0 to 63 by Hardware (DIP Switch)

Setting: - Baud rate

125kb, 250kb, 500kb by Hardware (DIP Switch)

Setting: - Bus Termination

The DIP Switch (S2) is used to switch on/off an internal bus termination (ON/OFF). Not used (OFF) in case of using an external termination of the network

Setting: - PRESET Value

The Preset function supports adaptation of the encoder zero point to the mechanical zero point of the encoder system. The factory PRESET value is zero [0]

The adjustment is carried out in 2 ways:

- by Hardware (PRESET push button)
- by Software (DeviceNet Protocol)

Equipment Configuration

Configuring parameters of the encoder can be achieved by a configuration tool in conjunction with an EDS file (Electronic Data Sheet). It contains all the characteristics of the encoder.

1) Default Setting

BTF/PRF: Absolute and incremental wire draw encoders for measuring lengths up to 50 m.

DATA SHEET



**Resolution
up to 0.025 mm**



Absolute Wire Draw Encoders

**Resolution
up to 0.025 mm**



Incremental Wire Draw Encoders

Wire draw encoders consist of wire draw mechanism and an encoder.



The rotation of the drum is proportional to the length being measured. This movement is counted by an encoder and converted to a measuring signal. This provides high-resolution position or distance information for linear measurement paths, even under difficult ambient conditions.

Precise linear guidance, as required for other length measurement systems, is not necessary.

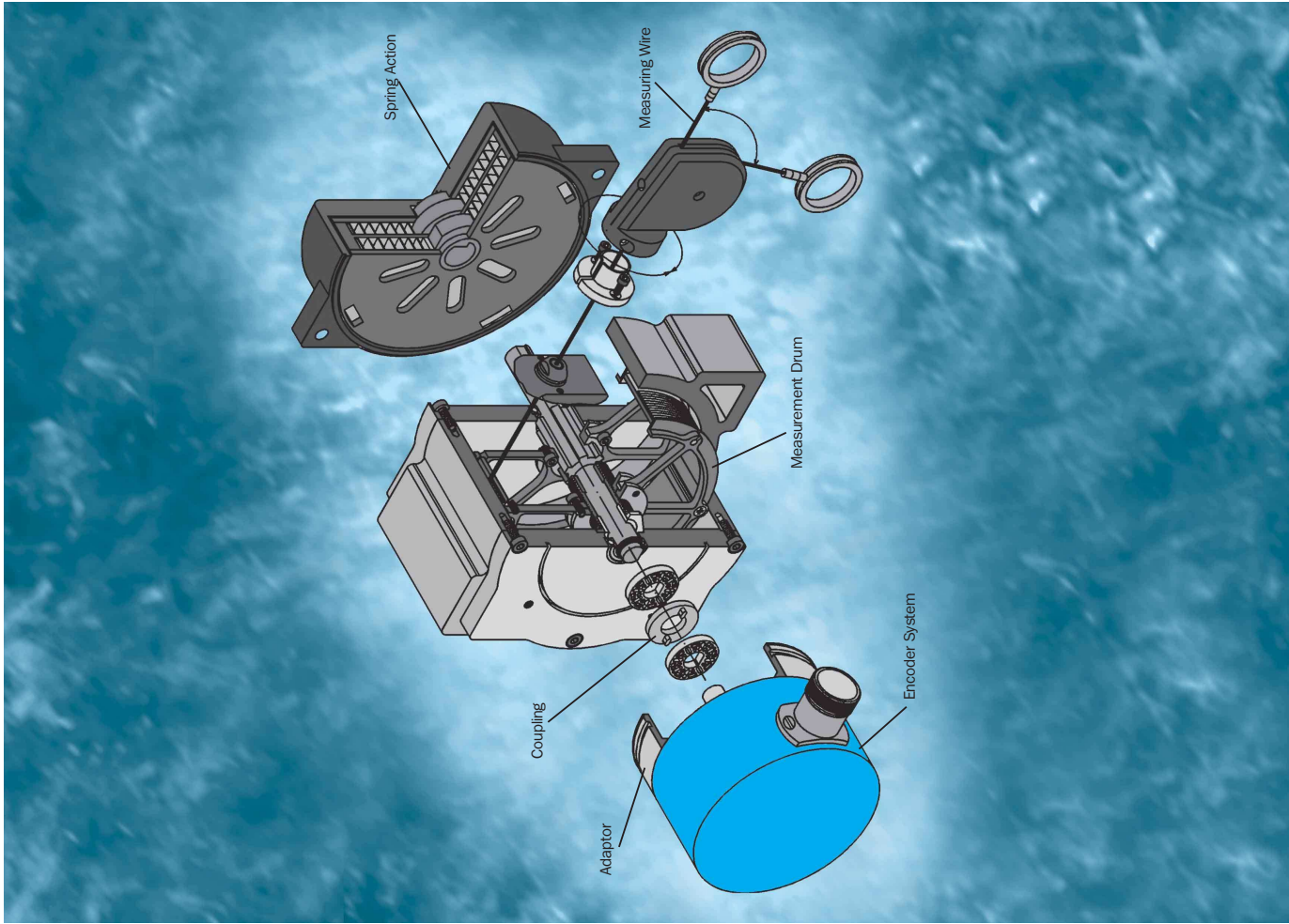
The combination of the wire draw mechanism and absolute or incremental encoders manufactured by SICK-STEGMANN enables made-to-measure solutions for almost any application profile.

To comply with the exacting demands of automation technology, these wire draw encoders offer the correct interface for every application:

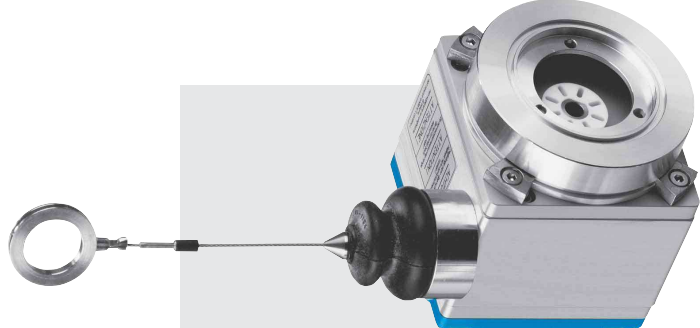
- SSI, Profibus, CANopen or DeviceNet field bus technology for absolute encoders
- HTL or TTL interfaces for incremental encoders.

For example, this product can be utilized in many applications including:

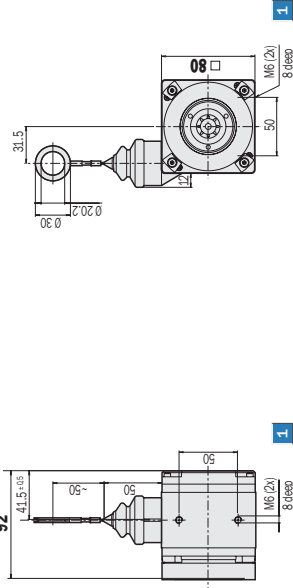
- Crane, drilling and excavator systems
- Presses, punching and injection machines
- Weir systems and locks
- High-bay shelving and theatre stages
- Woodworking and stone processing machines
- Machinery construction, medical technology and many other industries.



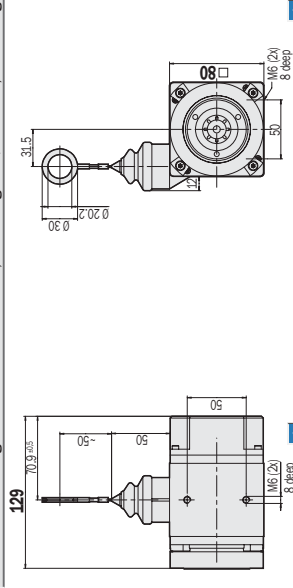
- Linear path measurement using a wire draw mechanism
- Easy mounting of the encoder
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel



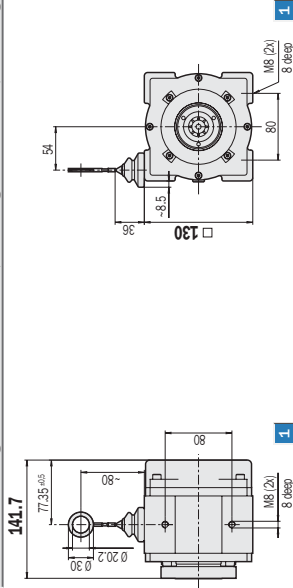
Dimensional drawing wire draw mechanism 2 m; measuring wire \varnothing 1.35 mm, servo flange



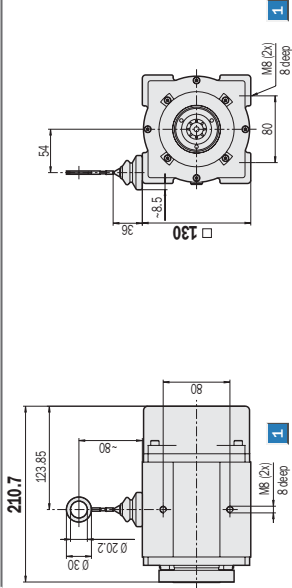
Dimensional drawing wire draw mechanism 3 m; measuring wire \varnothing 1.35 mm, servo flange



Dimensional drawing wire draw mechanism 5 m; measuring wire \varnothing 1.35 mm, servo flange



Dimensional drawing wire draw mechanism 10 m; measuring wire \varnothing 1.35 mm, servo flange

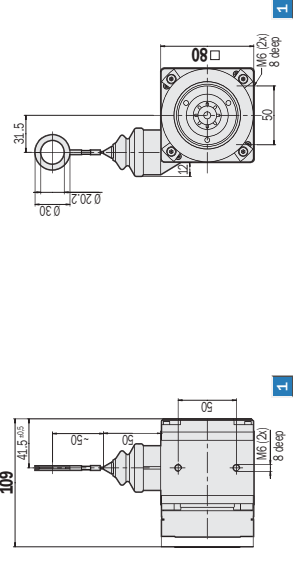


Accessories to suit this unit matching this:
Wire guiding rollers and spare parts kit
(page 40)

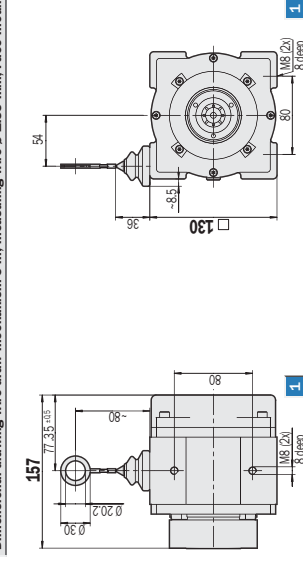
1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

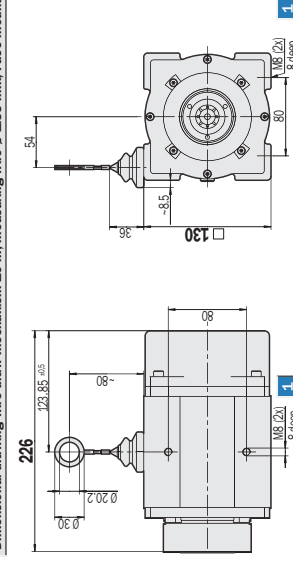
Dimensional drawing wire draw mechanism 2 m; measuring wire \varnothing 1.35 mm, Face mount flange



Dimensional drawing wire draw mechanism 5 m; measuring wire \varnothing 1.35 mm, Face mount flange



Dimensional drawing wire draw mechanism 10 m; measuring wire \varnothing 1.35 mm, Face mount flange

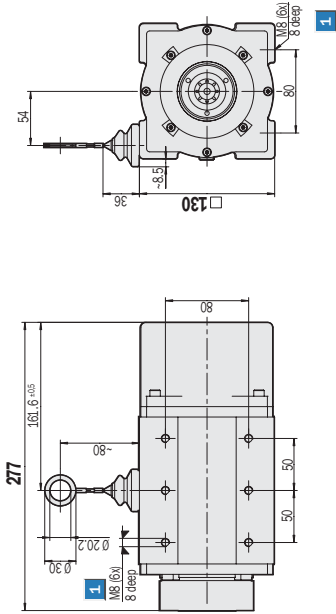


1 Threaded blind hole for mounting

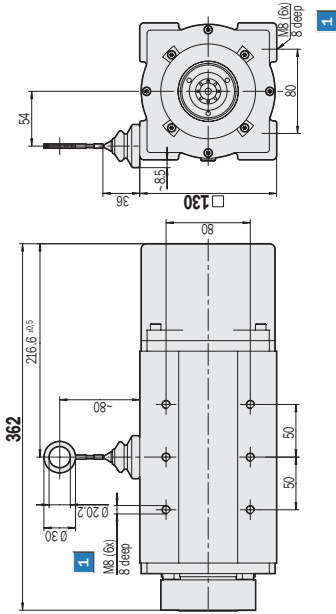
General tolerances to DIN ISO 2768-mk

Accessories to suit this unit matching this:
Wire guiding rollers and spare parts kit
(page 40)

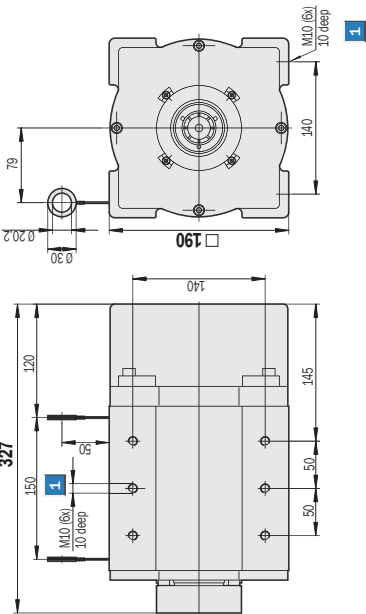
Dimensional drawing wire draw mechanism 20 m; measuring wire Ø 0.81 mm, Face mount flange



Dimensional drawing wire draw mechanism 30 m; measuring wire Ø 0.81 mm, Face mount flange



Dimensional drawing wire draw mechanism 50 m; measuring wire Ø 0.81 mm, Face mount flange



Accessories to suit this unit matching this:
Wire guiding rollers and spare parts kit
(page 40)

1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mK

Technical data Wire draw mechanism

Technical data	Measuring length			
	20 m	30 m	50 m	

Measuring wire (stainless)	Highly flexible stranded steel, Ø 0.81 mm
Drum housing	Highly flexible stranded steel, Ø 1.35 mm
Spring housing	Anodised Aluminium
	Plastic
Drum diameter	Die-cast zinc
	105 mm
	155.1 mm
Number of turns for full extension	61 approx.
	91 approx.
Drum precision	102 approx.
Operating speed	0.05 %
Spring return force (typ.)	4 m/sec.
start/finish 1)	10 N/20 N
Working temperature range	18 N/37 N
	- 20 ... + 70 °C
Protection to IEC 60529	IP 64
	IP 31
Life 2)	1 million cycles
Mass	5.0 kg
	6.2 kg
	16.5 kg

1) These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

2) Average values, which depend on the loading.
At high operating speeds over long lengths, this figure can decrease;
at slow operating speeds over short lengths, it can increase.

Absolute encoders: determining the matching number of steps of the encoder for the required linear resolution

No. of encoder steps per revolution =	3.1416 x (drum diameter + wire diameter)
	Linear resolution per measuring step

Example: required linear resolution 0.05 mm; wire draw mechanism 30 m

No. of encoder steps per revolution =	3.1416 x (105 mm + 0.81 mm)
	0.05 mm
	= 6648

Incremental encoders: determining the matching number of pulses of the encoder for the required linear resolution

No. of encoder pulses per revolution =	3.1416 x (drum diameter + wire diameter)
	4 x Linear resolution per measuring step

Example: required linear resolution 0.025 mm; wire draw mechanism 20 m

No. of encoder pulses per revolution =	3.1416 x (105 mm + 0.81 mm)
	4 x 0.05 mm
	= 1662

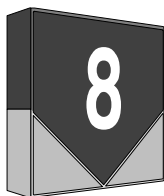
1 Based on the control/counter evaluating the flanks of the A+B pulses.

Order information MRA-F wire draw mechanism for attaching encoders with servo flange (or compatible flanges)

Type	Part no.	Description
MRA-F130-120D1	6028628	measur. length 20m
MRA-F130-130D1	6028629	measur. length 30m
MRA-F190-150D2	6028630	measur. length 50m

Order information MRA-F wire draw mechanism for attaching encoders with face mount flange (or compatible flanges)

Type	Part no.	Description
MRA-F130-420D1	6029791	measur. length 20m
MRA-F130-430D1	6029792	measur. length 30m
MRA-F190-450D2	6029793	measur. length 50m



AIR CONDITIONING UNITS

CONTENTS OF THE CHAPTER

AIR CONDITIONING UNIT AND COOLING SYSTEM	8.1-1
SPARE PARTS FOR COMPRESSOR F4	8.2-1
DUAL PRESSURE CONTROLS P78	8.3-1
SINGLE PRESSURE CONTROL P77	8.4-1
ELECTROMAGNETIC VALVE EVR	8.5-1
DESHYDRATOR DX / DN / DCL ... 164 / 165	8.6-1
THERMOSTAT A28	8.7-1
THERMOSTAT KP77	8.8-1
ATOMISATION – NOZZLE TYPE XB-XASR	8.9-1
SPARE PARTS FOR COMPRESSOR F3	8.10-1
SPARE PARTS FOR COMPRESSOR F5	8.11-1
ELECTRONIC CONTROLLER IC 915 (CABIN)	8.12-1

8.1 AIR CONDITIONING UNIT AND COOLING SYSTEM

1. DESCRIPTION AND TECHNICAL CHARACTERISTICS

1.1. AIR CONDITIONING UNIT FOR CAB

- Code : **1-10-898-00**
- Reference : **FR75-15 MEV – N° : 1636 to 1654**
- Evaporator power (minimum) . : **6020 kcal/H or fg/H (app.7 kW)**
- Temperature in cab : **20°C ± 2°C** (pre-adjusted to reach this temperature value)
- Refrigeric gas : **R227 (18kg)**
- Compressor : **Type BOCK FX5**
- Oil capacity : **Fuchs reniso Triton SE55 – 3.8 l**

1.2. COOLING SYSTEM FOR ELECTRIC PANEL

- Code : **1-10-897-79**
- Reference : **FR80 MEV227 – N° : 1658 to 1616**
- Evaporator power (minimum) . : **7050 kcal/H or fg/H (app.8.2 kW)**
- Temperature in electric panel : **30°C ± 2°C** (pre-adjusted to reach this temperature value)
- Refrigeric gas : **R227 (16 kg)**
- Compressor : **Type BOCK FX4**
- Oil capacity : **Fuchs reniso Triton SE55 – 2.6 l**

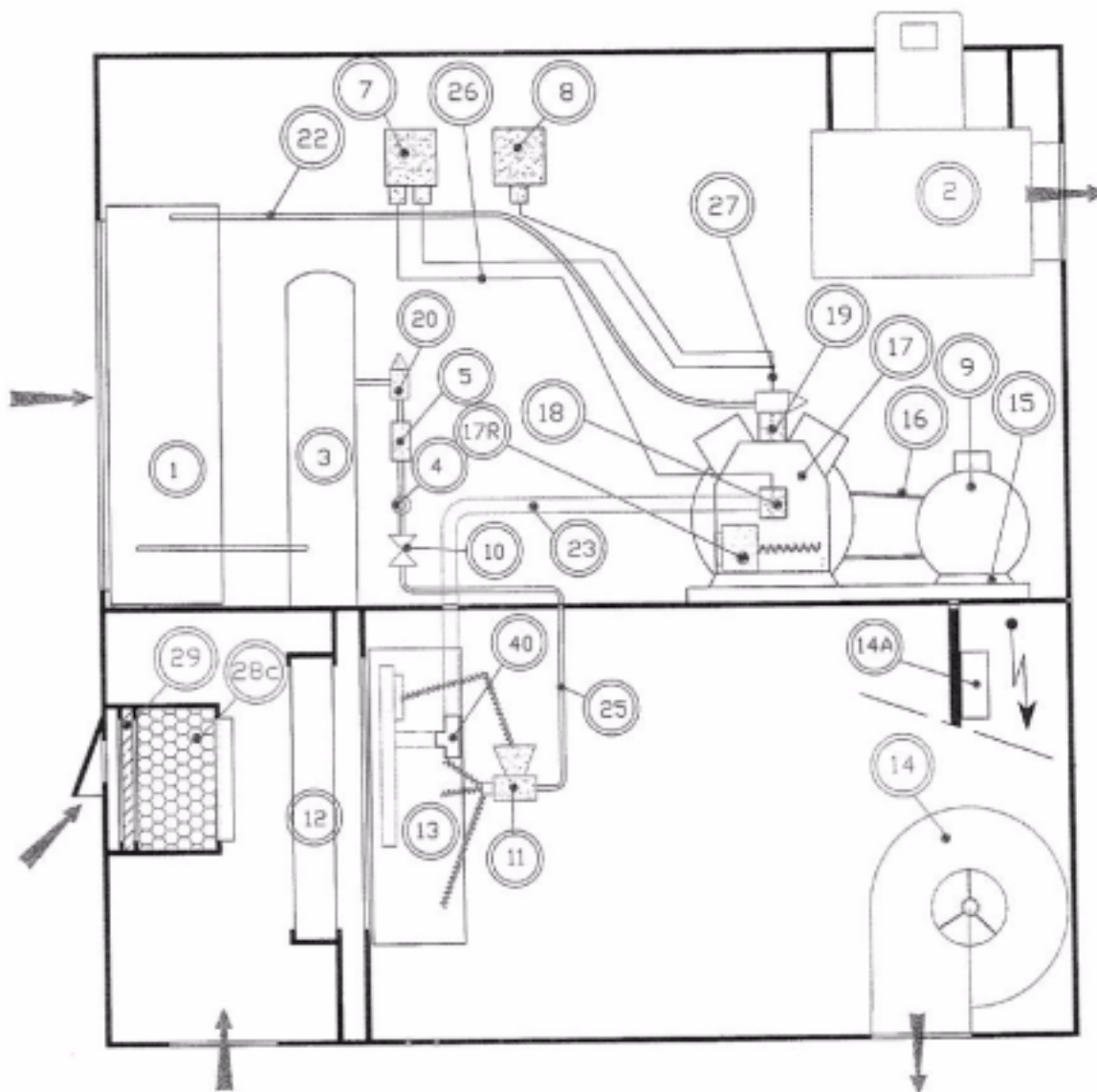
1.3. COOLING SYSTEM FOR CANDY BOX

- Code : **1-10-898-01**
- Reference : **FR52MEV – N° : 1503 to 1520**
- Evaporator power (minimum) . : **2925 kcal/H or fg/H (app.3.4 kW)**
- Temperature in electric panel : **30°C ± 2°C** (pre-adjusted to reach this temperature value)
- Refrigeric gas : **R227 (10 kg)**
- Compressor : **Type BOCK FX3**
- Oil capacity : **Fuchs reniso Triton SE55 – 1.5 l**

2. DIAGRAM AND COMPONENTS LIST FOR CAB

2.1. DIAGRAM

Air conditioner FR75-15 MEV: Code 1-10-898-00



2.2. COMPONENTS LIST (CAB)

REF	COMPONENTS	QTY	COMMENT	ECL CODE
1	Condensor	1		
2	Condensor fan	1		
3	Liquid tank	1		
4	Liquid window	1		
5	Deshydrator	1		0-10-328-18
7	High/low pressure switch	1		0-00-242-90
8	Modulating pressure switch	1		0-00-242-94
9	Unit electric motor	1		
10	Solenoid valve	1		
11	Expansive valve	1		
12	Filter A (PRP3) + seal	1		1-10-686-42
13	Evaporator	1		
14	Blowing fan	1		
14A	Motor electric variator	1		
15	Belt tension adjustment	1		
16	Belt	4		0-00-166-19
17	Compressor	1		
17R	Compressor heating resistor	1		
18	Inlet gate valve (yellow)	1		
19	Refill gate (red)	1		
20	Liquid outlet gate valve (blue)	1		
21	Cab thermostat	1		
22	Refill flexible	1		
23	Inlet flexible	1		
24	Condensor return flexible	1		
25	Liquid start flexible	1		
26	Pressure switch flexible BP	2		
27	Pressure switch flexible HP	1		
28C	Carbon filters SO ² HF	1		1-10-595-47
29	Prefilter (KP1) + seal	1		1-10-686-43
40	Pressure regulator	1		

3. DIAGRAM AND COMPONENTS FOR ELECTRIC PANEL

3.1. DIAGRAM

Air conditioner FR80 MEV227: CODE 1-10-897-79



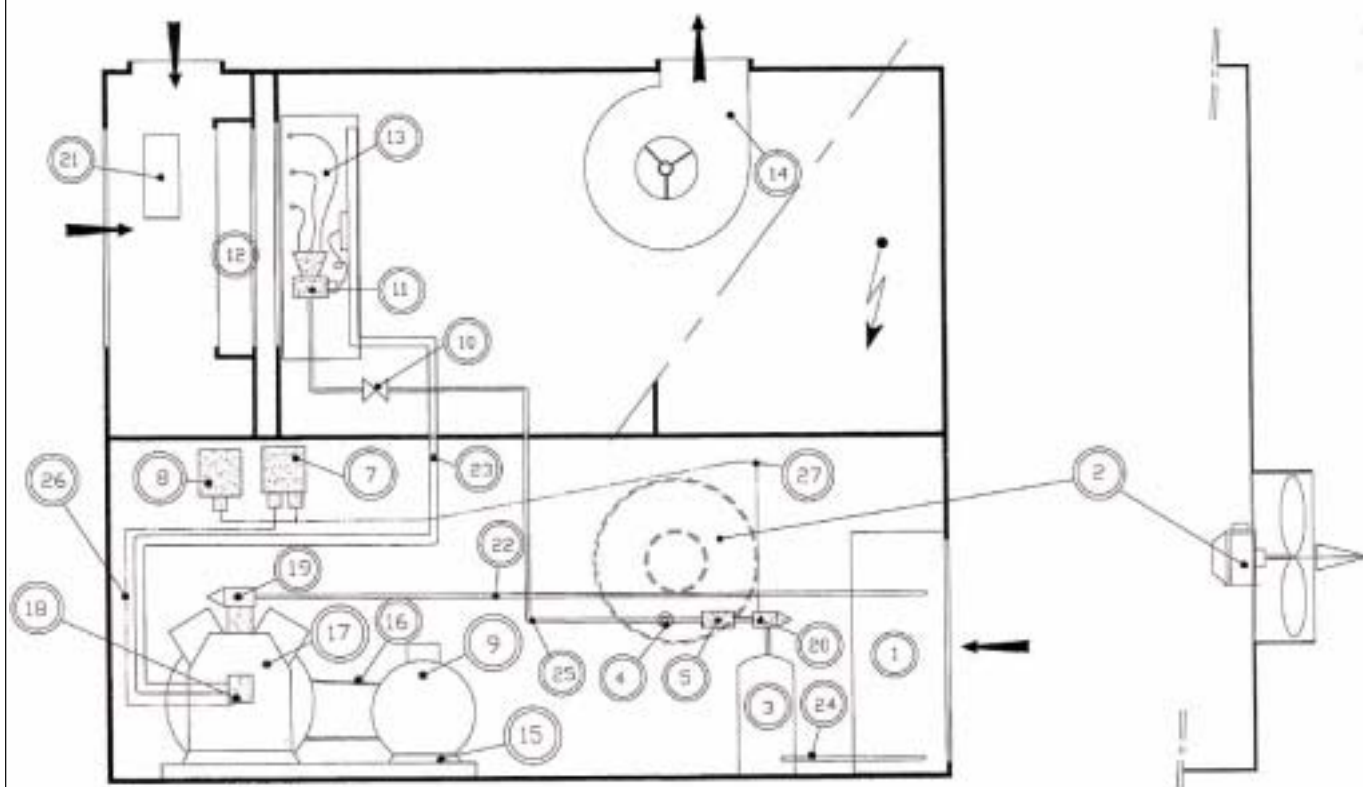
3.2. COMPONENTS LIST (ELECTRIC PANEL)

REF	COMPONENTS	QTY	COMMENT	ECL CODE
1	Condensor	1		
2	Condensor fan	1		
3	Liquid tank	1		
4	Liquid window	1		
5	Deshydrator	1		0-10-328-18
7	High/low pressure switch	1		0-00-242-90
8	Modulating pressure switch	1		0-00-242-94
9	Unit electric motor	1		
10	Solenoid valve	1		
11	Expansive valve	1		
12	Filter A (PRP3) + seal	1		1-10-686-42
13	Evaporator	1		
14	Blowing fan	1		
15	Belt tension adjustment	1		
16	Belt	3		0-00-166-19
17	Compressor	1		
18	Inlet gate valve (yellow)	1		
19	Refill gate (red)	1		
20	Liquid outlet gate valve (blue)	1		
21	Thermostat	1		
22	Refill flexible	1		
23	Inlet flexible	1		
24	Condensor return flexible	1		
25	Liquid start flexible	1		
26	Pressure switch flexible BP	2		
27	Pressure switch flexible HP	1		
28C	Carbon filters SO2+HF	1		
29	Prefilter new air	1		
30	Liquid start flexible	1		
40	Pressure regulation	1		
41	New air clapet	1		
42	New air electric motor	1		

4. DIAGRAM AND COMPONENTS LIST FOR CANDY BOX

4.1. DIAGRAM

Air conditioner FR52 MEV: Code 1-10-898-01



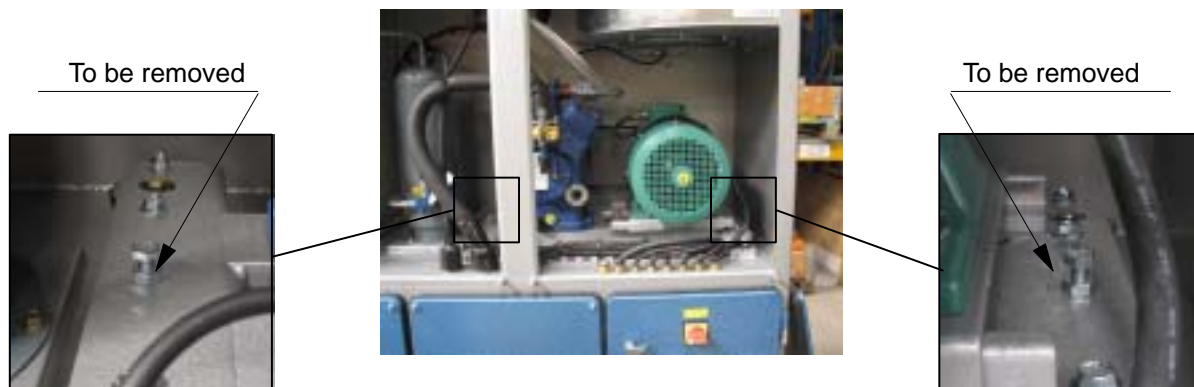
4.2. COMPONENTS LIST (CANDY BOX)

REF	COMPONENTS	QTY	COMMENT	ECL CODE
1	Condensor	1		
2	Condensor fan	1		
3	Liquid tank	1		
4	Liquid window	1		
5	Deshydrator	1		0-10-328-18
7	High/low pressure switch	1		0-00-242-90
8	Modulating pressure switch	1		0-00-242-94
9	Unit electric motor	1		
10	Solenoid valve	1		
11	Expansive valve	1		
12	Filter A (PRP3) + seal	1		1-10-686-42
13	Evaporator	1		
14	Blowing fan	1		
15	Belt tension adjustment	1		
16	Belt	2		0-00-166-19
17	Compressor	1		
17R	Compressor heating resistor	1		
18	Inlet gate valve (yellow)	1		
19	Refill gate (red)	1		
20	Liquid outlet gate valve (blue)	1		
21	Thermostat	1		
22	Refill flexible	1		
23	Inlet flexible	1		
24	Condensor return flexible	1		
25	Liquid start flexible	1		
26	Pressure switch flexible BP	1		
27	Pressure switch flexible HP	1		

5. START UP PROCEDURE

Important : If present, remove all the protection measures installed on the air-conditioner for transport (fastening, plate of protection...). The compressor can not start unless the temperature inside the cab is higher than the thermostat set temperature, there fore higher than 25°C

Cabin air conditioner Hindalco specificity: Check that compressor + motor cradle fastening is removed



Open the doors of both conditioner compartments to the valves :

- upflow, mark **19**, red colour
- suction : mark **18**, yellow colour (Qty 2 on F5 compressor)
- liquid supply valve : mark **20**, blue colour of liquid thank mark **3**

Refrigeration start up :

- Remove the gate valve protection cap giving access to the control shaft of the valve
 - For valve **19**, (upflow), loosen and move pin 1 backwards to position A (see fig. 11)
 - For valves **18** (suction) and **20** (liquid supply), loosen and move pin 1 backwards, then tighten one rotation (fig. 12) to connect the control pressure sensitive switches.

Conditioner control :

- If the conditioner is controlled through a pressure sensitive switch, it should be set at 25°C (cab) / 35°C (beam (on electric panel))
- Check the motor rotation direction according to the arrows, if incorrect, reverse two phases on the conditioner's general supply
- The conditioner is started through the commuter on position 2 (COND)

REMINDER POSITION 1 – Ventilation (FAN)
 POSITION 0 – Stop (0)
 POSITION 2 – Conditioner . . . (COND)

Note :

Ventilator condenser **2** starts by building up pressure controlled by pressure sensitive switch **8**.

The compressor operation depends on the thermostat setting

Thermostat setting :

If the conditioner is controlled through a mechanical thermostat, the neutral section of the differential is 1°C and its temperature setting 25°C



CAUTION

The compressor box should be preheated for 24 hours (48 hours in case of great cold) before starting up the conditioner after a general idle period (ex start up). This is done by turning on the conditioner, commuter on stop position (0) ready to refrigerate. General switch on + ACQF1 on & ACQF2 on

The pre-heating of the casing separates the gas mixed with oil and avoids damage of the compressor.

Always close all conditioner doors.

AFTER PRE-HEATING, IT IS IMPERATIVE TO CHECK THE OIL LEVEL

Shut-off valves :

The yellow suction shut-off valve, the red upflow shut-off valve and the blue liquid supply shut-off valve should be open prior to starting the compressor, on position A, then suction and liquid valve switched to position B.

Opening :

Pin 1 : rotate to the stop leftwards (counter clockwise).

→ valve completely open/service connection piece 2 closed (position A), fig. 11.

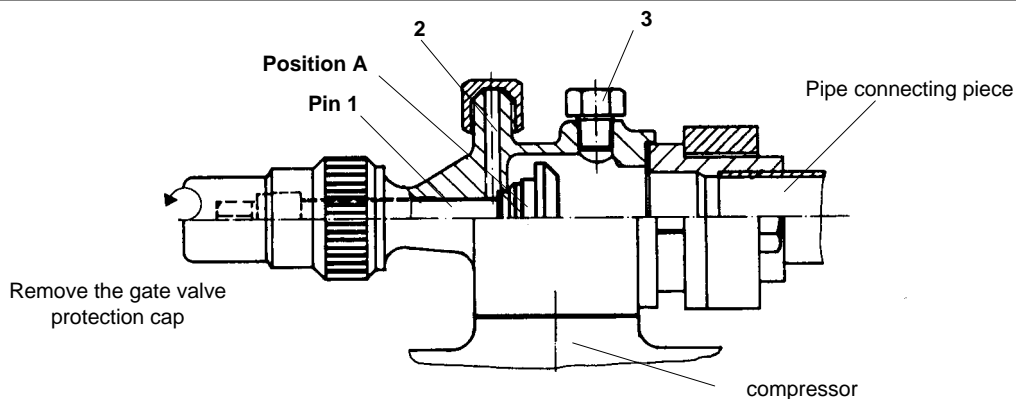


Fig 11

Service connecting piece opening (2) :

Pin 1 : rotate a 1/2 to 1 rotation rightwards (clockwise).

→ service connecting piece 2 open / shut-off valve open (position B), fig. 12.

service connecting piece 3 cannot be tightened always open.

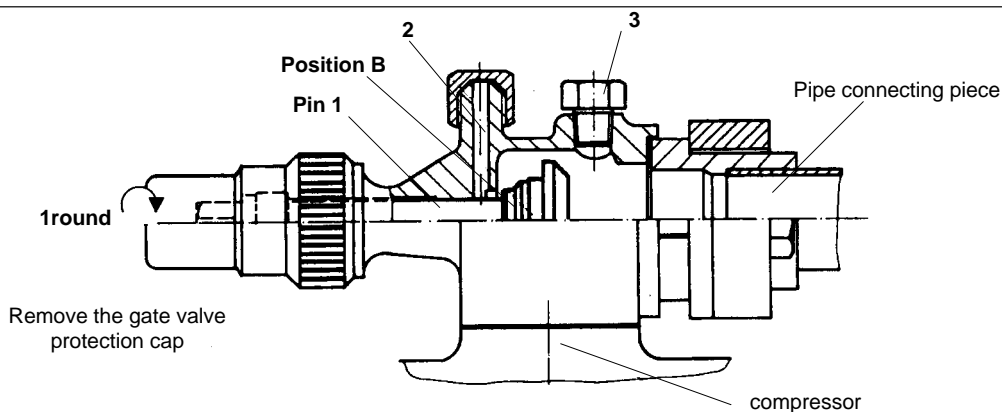


Fig 12

Complementary information

Prior to opening or closing the shut-off valve, untie the valve rod seal 1/4 rotation. After the gate valve operation, tighten the valve rod seal.

6. PREVENTIVE CONDITIONER MAINTENANCE

6.1. LUBRICATION

COMPRESSOR	OIL / R124 ⁽¹⁾	COMPRESSOR	OIL / R227 ⁽²⁾	QTY (L)	INSTRUCTION	FREQ.
BOCK F3	FUCHS – RENISO SP 46	BOCK FX3	FUCHS – RENISO SE 55	1,5 L	Clean the filter (48) at each draining.	1 Year
BOCK F4		BOCK FX4		2,6 L		1 Year
BOCK F5		BOCK FX5		3,8 L		1 Year

Never mix the oil type when oil make-up.

Note (1): Similary oil type for the compressor : only if SP46 oil and Refrigerant gas R124

- ESSO ZERICE S. 46 (Alkylbenzene oil)
- MOBIL GARGOYLE ARTIC SHC.425 (Alkylbenzene oil)
- SHELL ... CLAVUS SD-22-12 (Partly synthetic oil)
- TEXACO .. CAPELLA WF.46 (Mineral oil)
- BP ENERGOL LPT 46 (Mineral oil)
- BP ENERGOL LPS 46 (Alkylbenzene oil)

Note (2): Similary oil type for the compressor : only if SE55 oil and Refrigerant gas R227

- MOBIL ARTIC S46
- SHELL ... RL 1090

6.2. WEEKLY ROUTINE MAINTENANCE

The plant personnel should remove the dust at least once a week.

- stop the conditioner
- open the doors & access panels
- used an air compressed at 2 bar and maintain nozzle at appropriate distance, and blow in the opposite direction of air passage
- concerning the optionals pre-filters, use a 2 bars air compressed maxi, remove the filters and blow compressed air nozzle at appropriate distance, and blow in the opposite direction of air passage through the filter then put the filters back in place.
 - the **pre-filter (KP1)** located behind the air inlet or re-entry grid should be replaced when it is damaged (after approximately 6 blows)
 - the **inlet or re-entry filter (PRP3)** located in front of the evaporator can also be cleaned with a high pressure cleaner using moderate pressure. The filter should be replaced when completely clogged or damaged (approximately once a year).
 - The **active coal filter (HF & SO)** located on the new air intake may be turned 1/2 rotation at every disassembly, since it is used on part of its surface only. Since the cleaning isn't very effective, it should be replaced when clogged (once or twice a year).
- blow clean the compressor compartment : blow the condenser from inside to outside taking care not to damage the fins
- blow clean the evaporator from the ventilation side (2 bars maxi), clean the ventilator
- clean the condensate tank (2 bars maxi) located under the evaporator and the flush pipe
- Close the doors and access panels and check their seals

Note : in the event of return workshop

If the evaporator or condenser is dirty, it can be cleaned with water using a high pressure cleaner, after covering electric components.

6.3. MONTHLY MAINTENANCE

Compressor stopped and idle

- check oil level (top up as needed) (see fig.15)
- check motor rolling
- check belt condition and tension (see fig.15a)

Consequence of a bad belt tensioning:

- If highest : breaking, abnormal wear an tear, destruction of the bearing polley
- If too weak : un-grooving, abnormal wear an tear, bad training
- check anchoring on all parts
- check door and seal tightness

Oil level indicator

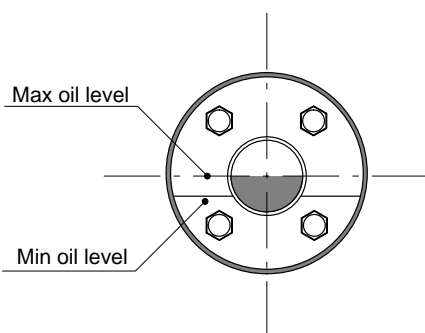


fig.15

Belt tensioning

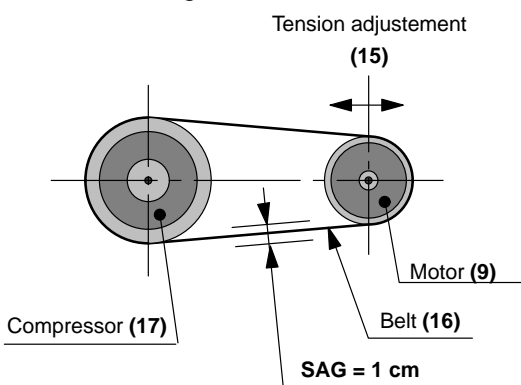


fig.15a

Frigoric gas level indicator

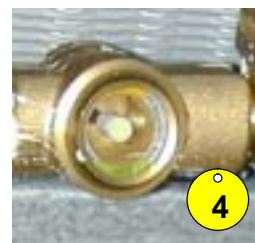


fig.15b

Compressor on

- check the refrigerant load using the indicator, mark 4 (see fig. 15b), the liquid should not bubble too much; if more refrigerant is needed, check for leaks is imperative (by a frigorist), and change any defective part as well as deshydrator 5

Conditioner start up

- close the gates (doors & panels)

6.4. ANNUAL MAINTENANCE WORK

Compressor stopped and idle

- compressor shaft seal tube replaced (impregnate the felt joint by oil immersed)
- oil flush and strainer cleaning
- change the deshydrator
- check electrical connections
- check electric components for proper operation
- replace the compressor contactor ACKM1 every 2 years

7. WORK AND COOLING SYSTEM

Legend : HP = High Pressure / LP = Low Pressure

7.1. PRECAUTIONS AND WARNING

The cooling system should be opened by specialized technicians only, trained to cooling systems. The following tools are needed :

- depending on work :
 - one HP and LP manometer with a temperature scale for the refrigerant used
 - one open circuit pump
 - one leak detector
 - one recommended refrigerant can
 - recommended refrigerant oil
 - one deshydrator
 - necessary spare parts (expansive valve **11** every 3 to 5 years)

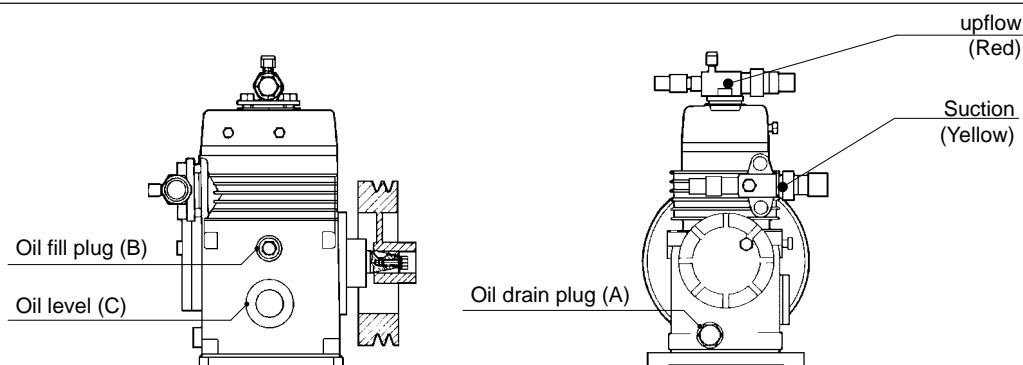
7.2. WORK INVOLVING THE SYSTEM'S SUCTION SECTION

The work in this procedure includes :

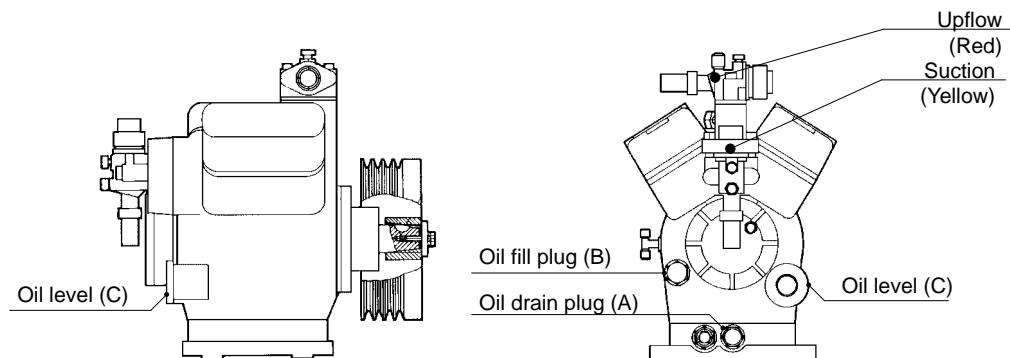
Compressor oil and shaft packing change

- stop and turn off the conditioner
- install the BP and LP manometer on valves **19** and **20**
- close the upflow valves mark **19** and suction mark **18** (2 suction valves on F5 compressor)
- flush the compressor to reach 0 pressure using the manometer, and disassemble the compressor
- loosen the flush nut mark A in fig. 16 and nut B, all the way
- flush compressor oil (fig.16)
- loosen nut A all the way and clean the strainer
- put nut A back in place
- fill the compressor with oil through nut B and check the level through indicator C, proper level is 3/4 full
- place nut B back
- change the compressor shaft packing
- vacuum in compressor after reassembling (procedure B)
- remove the manometer
- start the suction and upflow valves
- turn on the conditioner

BOCK F3



BOCK F4



BOCK F5

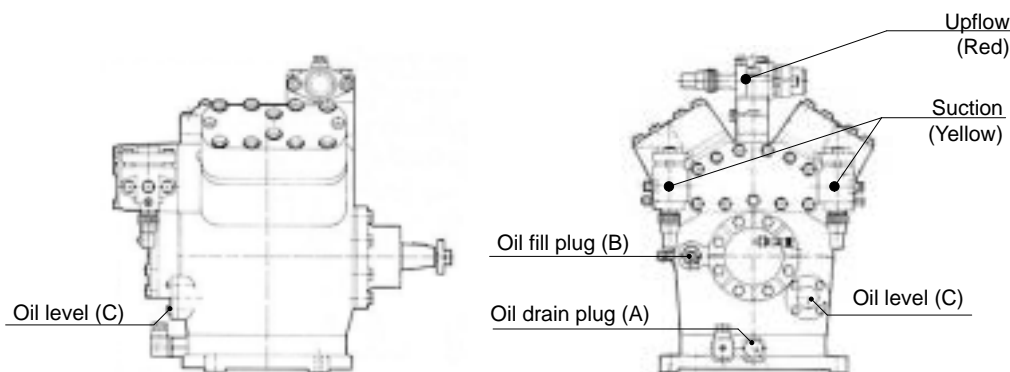


fig.16 – rev01

- For TE2 type pressure relief valves, full change. Follow the following step when reassembling.
 - check that the refrigerant type used is indicated on the upper side
 - recover the gauged opening of the old pressure reducer
 - connect the equalization tube at orifice
 - place the pressure relief valve bulb on the copper evaporator suction piping and fasten the bulb using two rings, then place a heat cover on the piping bulb unit
- If the orifice cartridge needs changing :
 - check that the new cartridge has the same orifice number as the previous one
 - loosen the nut of the old pressure reducer and regulate the new pressure reducer with the same value

Note :

For TE2 type pressure relief valve by counting the number of half rotations, to close or open the pressure relief valve and use the same setting for the new one.

PROCEDURE A – changing the deshydrator

- place LP manometer on valve **18** and HP on valve **19**, close liquid supply valve **20**
- rotate the compressor to a pressure of 0,1 bar, the gas being stored in tank **3**, and turn off the conditioner
- replace the deshydrator **5** and follow the arrows with the correct liquid flow
- vacuum in the liquid line and evaporator
- put valve **20** back in its initial position
- remove the manometer and put valves **18** and **19** back into their initial positions
- turn on the conditioner

7.3. FULL FILL-UP PROCEDURE

In the event the load is lost due to a leak :

- stop and idle the conditioner
- place the manometer
- change the defective part
- replace the deshydrator **5**
- vacuum in the circuit (procedure B)
- check the weight and refrigerant type for the conditioner in the instructions
- through upflow valve **19**, transfer the refrigerant weigh (a heat build up of the refill can is needed for full migration of the can to the conditioner)
- after full fill up, remove the manometer
- put the valves back into their initial positions
- turn conditioner back on

PROCEDURE B – to put the vacuum :**Purpose :**

- remove the air and humidity from the device prior to filing up with refrigerant. We describe the simple flush method using a vacuum pump
- turn of and idle the conditioner
- check that the three shut-off valves (suction, fill up and liquid) are fully unscrewed
 - remove the fill up cap of the shut-off valves in order to connect the blue and red distributor flexible pipes.
- connect the vacuum pump to the central connection distributor
 - screw both shut-off valves and start the pump in order to evacuate by suction
 - stop the pump and wait half an hour to check the circuit for tightness
 - if the tightness isn't good, repeat the leak detection process, and remove the defective part
 - repeat the procedure
 - if the tightness is good, carry out the conditioner fill-up procedure

PROCEDURE C – top up refrigerant fill-up

- check that the three liquid, fill up and suction shut-off valves are on their normal operation position (unscrewed)
- rotate the conditioner
- fill-up through valve **18** until bubbling disappears, as checked through indicator **4**
- if there is no bubbling, or better still, after introducing the proper refrigerant weigh, close the can shut-off valve and the distributor shut-off valve and disconnect the central pipe
- remove the distributor
- put the shut-off valve protection cap back and the can cap
 - close the pipe fill-up holes. Put the caps back on the operating shut-off valve connecting pieces

Note :

At every fill-up, check for leaks and remove any defective part.

8. BREAKDOWN**8.1. COMPRESSOR DOESN' T START**

- check supply
- check temperature setting
- check ventilator – evaporator **14** operation and commutor position on II
- check LP/HP mark **7** pressure relief valve
- check ACQF 3 breaker on group motor
- check belts

8.2. HP-LP PRESSURE RELIEF VALVE DISCONNECTION**Low pressure**

- not enough load (see procedure C)
- defective electric valve mark **10**
- temperature is too low at evaporator mark **13**
- dirty evaporator mark **13**
- clogged filter mark **12**
- clogged deshydrator mark **5** (see procedure A)
- defective pressure relief valve mark **11**
- check valves

High pressure

- clogged condenser mark **1**
- air in circuit
- temperature is too high in condenser
- excess load
- tripped ventilator mark **2**

8.3. EXAMPLE OF ADJUSTMENT VALUES (R227)

IMPORTANTE NOTE : The values included in the following table are an example

Rep	Designation	PSIG	BAR	SITE VALUES
7a	<u>Low pressure switch</u>			
	OFF	0	0	
	ON	7,3	0,5	
7c	<u>High pressure switch</u>			
	OFF	334,5	23	
	ON	261,8	18	
8	<u>Condenser pressure switch</u>			
	OFF	167,3	11,5	
	ON	196,4	13,5	

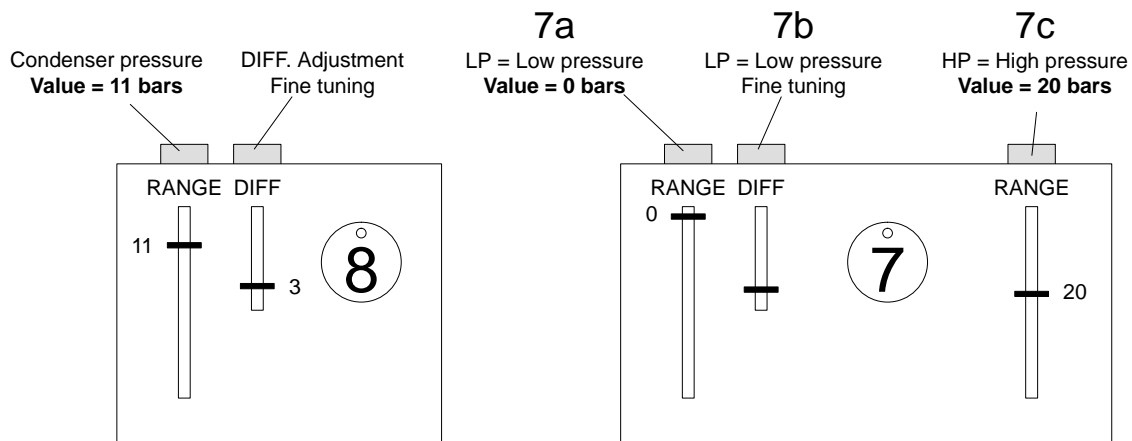


fig.17 – Example rev01

8.2 SPARE PARTS FOR COMPRESSOR F4

LOCATION	DESIGNATION	ECL CODE (A/C UNIT)	COMPRESSOR	ECL CODE
Cooling system of electric panel	FR52MEV	1-10-702-84	BOCK FX4	0-05-320-79



MA'ADEN

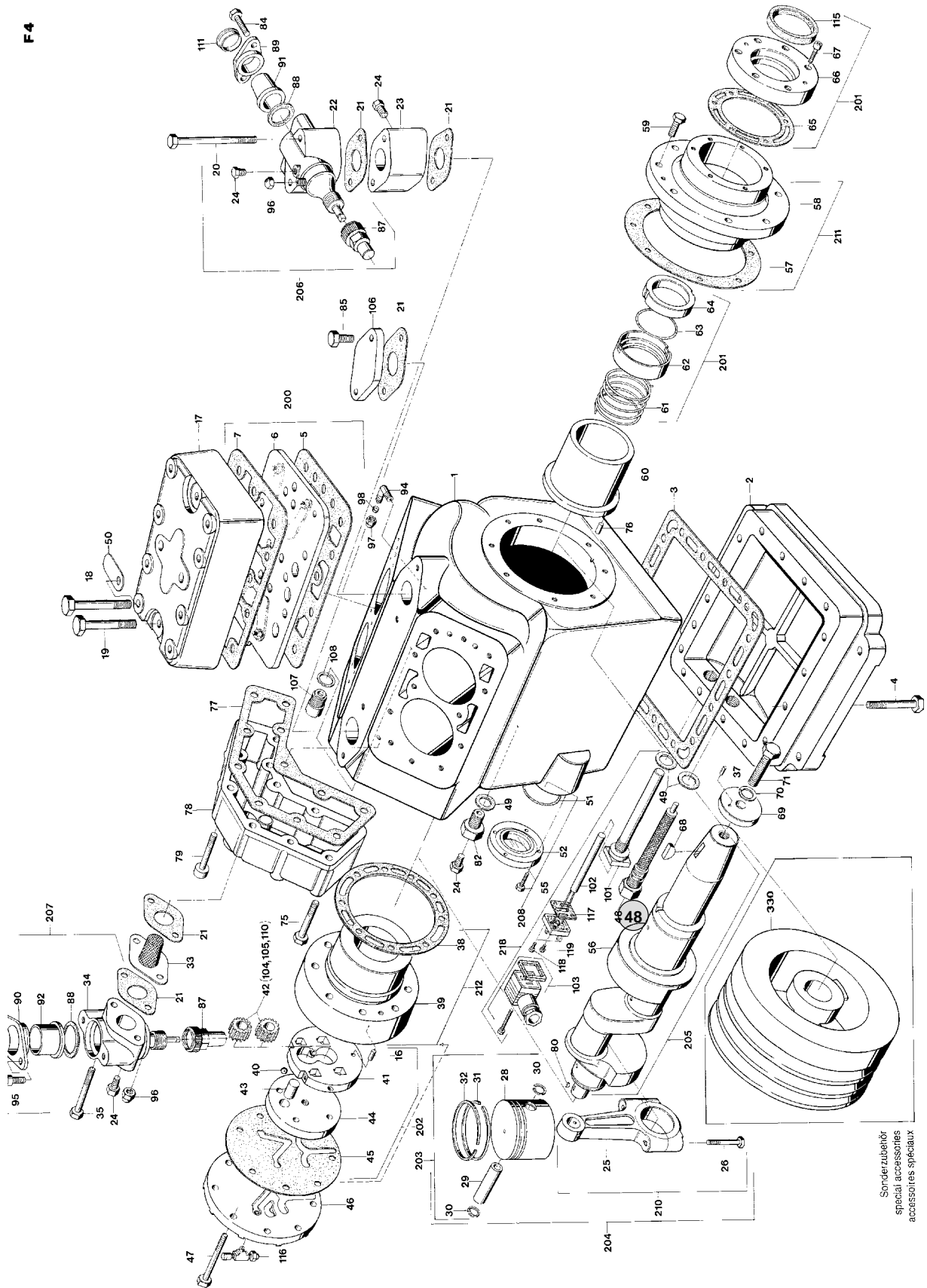
MAINTENANCE MANUAL OF THE POT TENDING MACHINE

SPARE PART LIST OF THE F4 COMPRESSOR

POSITION	CODE	DESCRIPTION	ONLY AVAIL. AS COM. AS. KIT / ITEM	QTY	NOTE
1	4014	COMPRESSOR CASING	219	1	
2	4041	BASE PLATE		1	
3	5046	BASE PLATE GASKET		1	
4	5431	HEX. HEAD SCREW M8X55		16	
5	5028	LOWER VALVE PLATE GASKET		2	
6	7149	VALVE PLATE, COMPLETE	200	2	
7	5010	UPPER VALVE PLATE GASKET		2	
16	5688	GROOVED PIN 5X14		2	
17	4089	CYLINDER COVER		2	
18	6828	HEXAGON HEAD SCREW M10X75		20	
19	6820	HEXAGON HEAD SCREW M10X65		4	
20	5455	HEX. HEAD SCREW M10X110		2	
21	5083	VALVE FLANGE GASKET		5	
22	7128	SHUT-OFF VALVE LESS SOLD UNION		1	
23	4167	INTERMEDIATE FLANGE OVAL 46MM		1	
24	5514	LOCKING SCREW 1/8" NPTF		4	
25	4481	CONNECTING ROD 90 LONG	210	4	
26	5516	CONNECTING ROD SCREW M6X30		8	
28	7111	PISTON DIA 55 OPTIMIZED	203	4	
29	7212	PISTON PIN DIA.15X10X46		4	
30	5551	SEEGER CIRCLIP 15X1		8	
31	5390	OIL CONTROL RING PISTON 55		4	
32	5380	TAPERED COMPR.RING PISTON 55		4	
33	3370	FILTER SUCTION SIDE		1	
34	7128	SHUT-OFF VALVE LESS SOLD UNION		1	
35	6034	HEX. HEAD SCREW M10X65		2	
37	5686	CLAMPING SLEEVE 4X8		1	
38	5056	REAR BEARING FLANGE GASKET		1	
39	4125	REAR BEARING FLANGE		1	
40	5566	STEEL BALL DIA.9		4	
41	4381	PUMP-CASING		1	
42	5328	SET GEAR WHEEL OIL-PUMP		1	
43	5700	CYLINDER ROLLER 13X20		1	
44	4382	PUMP PLATE		1	
45	5077	COVER PLATE GASKET		1	
46	4164	COVER PLATE		1	
47	6624	HEX. HEAD SCREW M8X50		8	
48	4442	OIL FILTER, CPL.		1	
49	5342	SEAL RING 27X22X2		3	
51	5153	O-RING DIA.34,59X2,62		1	
52	6001	SIGHT GLASS	208	1	
55	5402	HEX. HEAD SCREW M6X16		4	
56	7224	CRANKSHAFT 49 STROKE	205	1	



F4



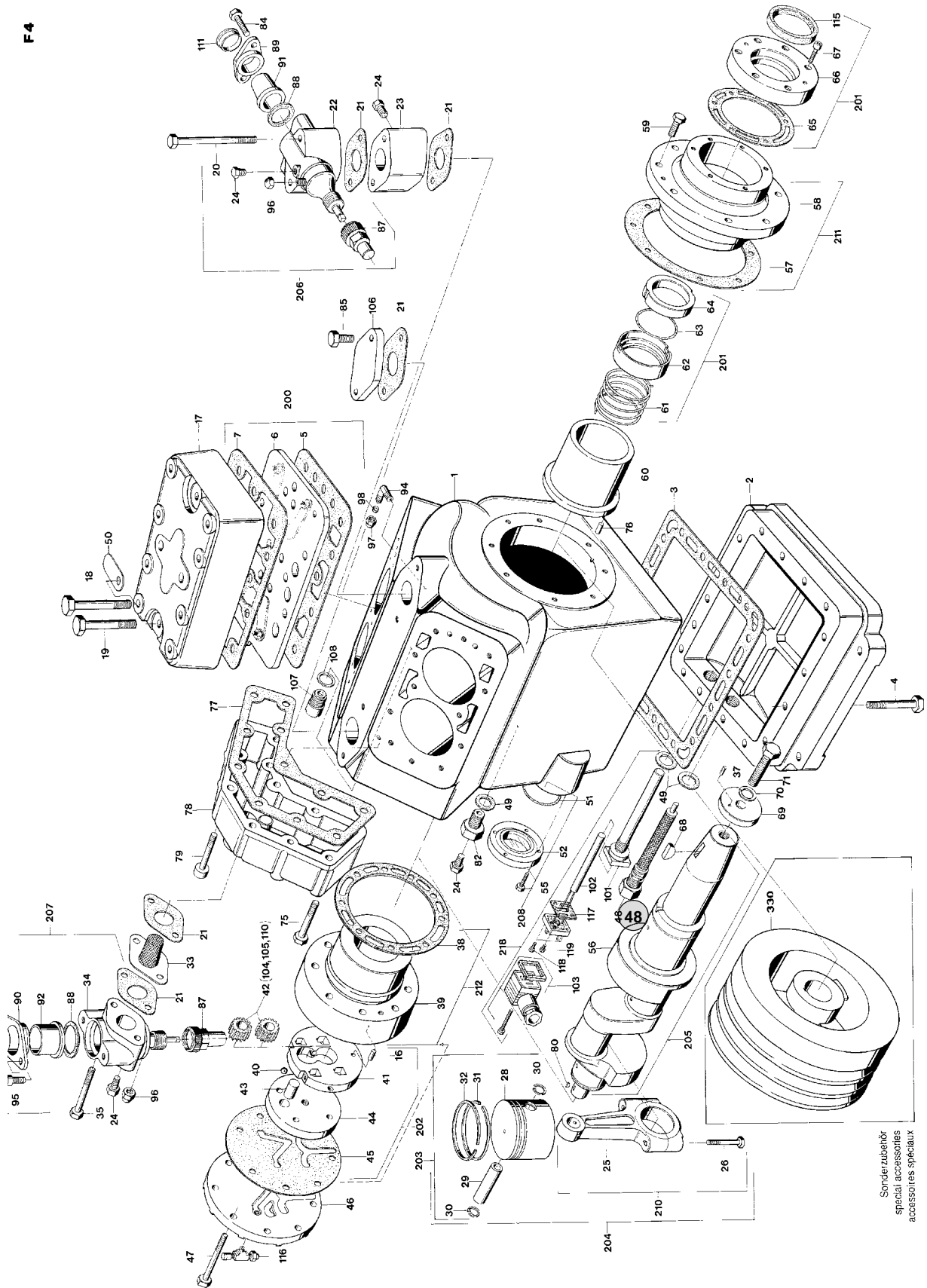
MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

SPARE PART LIST OF THE F4 COMPRESSOR

POSITION	CODE	DESCRIPTION	ONLY AVAIL. AS COM. AS. KIT / ITEM	QTY	NOTE
57	5058	FRONT BEARING FLANGE GASKET		1	
58	4141	FRONT BEARING FLANGE		1	
59	5846	HEX. HAED SCREW M10X30		8	
60	4359	FRONT BEARING		1	
61	6405	PRESSURE SPRING	201	1	
62	6403	GUIDE RING F.SHAFT SEAL GASKET	201	1	
63	5160	O-RING DIA.37,70X3,53	201	1	
64	6401	RING SLIP	201	1	
65	5063	SHAFT SEAL COVER GASKET		1	
66	4308	SHAFT SEAL COVER	201	1	
67	6067	CYLINDER SCREW M8X25		6	
68	5673	WOODRUFF KEY A5X9		1	
69	4425	DISC DIA. 50X12,5X8		1	
70	5666	SPRING WASHER B12		1	
71	5462	HEX. HEAD SCREW M12X40		1	
75	6624	HEX. HEAD SCREW M8X50		8	
76	5688	GROOVED PIN 5X14		1	
77	5071	GASKET COVER SUCTION SIDE		1	
78	4162	COVER SUCTION SIDE		1	
79	5484	CYLINDER SCREW M8X40		3	
80	5670	WOODRUFF KEY A3X3,7		1	
82	5956	LOCKING SCREW M22X1,5		1	
84	5447	HEX. HEAD SCREW M10X35		2	
85	5846	HEX. HAED SCREW M10X30		2	
87	5784	CAP NUT M22X1,5		2	
88	5067	GASKET SOLDERED CONNECT.		2	
89	4329	FLANGE OVAL 16MM		1	
90	4329	FLANGE OVAL 16MM		1	
91	4367	BRAZED HEXAGON NIPPLE DM 28		1	
92	5313	BRAZED HEXAGON NIPPLE DM 35		1	
94	5541	SCREWED UNION DIN 8906		1	
95	5489	CYLINDER SCREW M10X35		2	
96	5789	CAP NUT UNF 7/16"		2	
97	5528	UNION NUT 7/16" UNF		1	
98	5545	SEALING CAP 7/16" UNF		1	
101	7572	HEATING ELEMENT HOUSING 60-80W	218	1	
102	7565	HEATER INSERT 80W 220-240V	218	1	
	7569	HEATER INSERT 80W SPEC.VOLTAGE	218	1	
103	5972	CABLE BOX	218	1	
104	5329	GEAR WHEEL OIL-PUMP DRIVEN	202	1	
105	5338	GEAR WHEEL OIL-PUMP DRIVEN	202	1	
106	4269	BLANK FLANGE 15MM		1	
107	7940	SAFETY VALVE F. 25BAR OPER.		1	

F4



MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

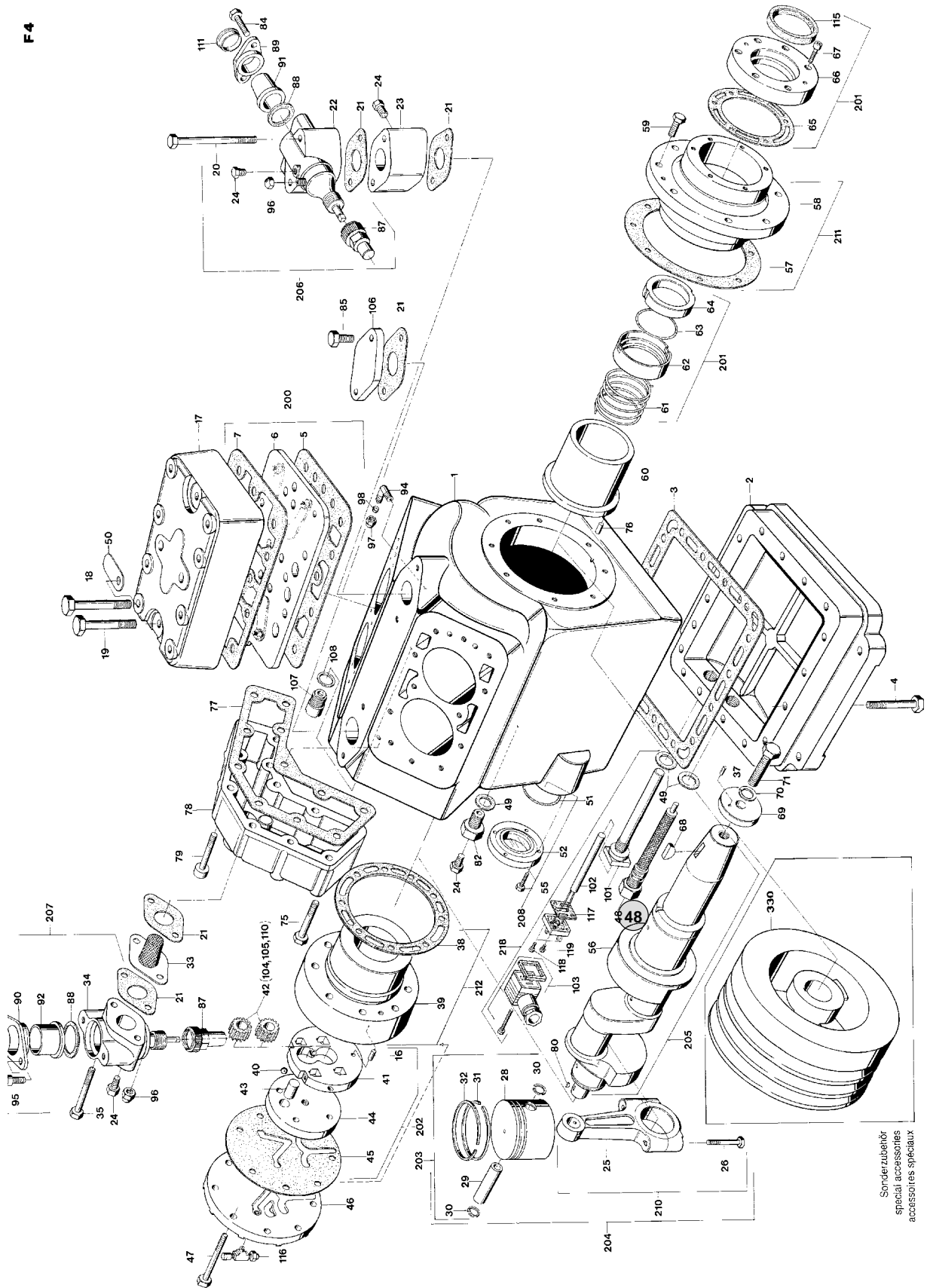
SPARE PART LIST OF THE F4 COMPRESSOR

POSITION	CODE	DESCRIPTION	ONLY AVAIL. AS COM. AS. KIT / ITEM	QTY	NOTE
108	5791	SEAL RING 27,8X24,2X2		1	
110	5375	BEARING BUSH DIA.15XDIA.13X10	202	1	
111	5619	PROTECTIVE PLUG DIA.28,8		1	
112	5620	PROTECTIVE PLUG DIA.35,5		1	
113	6256	NAMEPLATE,UNPRINTED 35x61 MM		1	
115	5841	RADIAL SHAFT SEAL RING		1	
116	5752	TEE-PIECE W.SCHR.CONN.ONE		1	
117	5971	GASKET F.PLUG BASE	218	1	
118	5958	CYLINDER SCREW M3X10	218	2	
119	5959	CYLINDER SCREW M3X4	218	1	
124	9983	LABEL" CONNECTION PLAN TO BE FIXED AT OIL SUMP HEATER TO BE FIXED AT OIL SUMP HEATER		1	
198	9702	OPERATING INSTRUCTIONS F1-16 INDIVIDUALLY ADDED		1	

ASSEMBLY KITS

POSITION	CODE	DESCRIPTION	ONLY AVAIL. AS COM. AS. KIT / ITEM	QTY	NOTE
200	8198	SET VALVE PLATE	5-6-7	2	0-03-357-45
201	8008	SET SHAFT SEAL	61-62-63-64-65 66-67-115	1	0-03-357-25
202	8044	SET OIL PUMP	16-40-41-42-43 44-45-104-105-110	1	0-04-321-98
203	80103	SET PISTON DIA 55 (OPTIMIZED)	28-29-30-31-32	4	0-03-357-85
204	8022	SET PISTON-CONNED.ROD(55,OPT.)	25-26-28-29-30 31-32	4	0-03-357-29
205	8055	SET CRANKSHAFT	56-68-80	1	0-03-357-86
206	8084	SET SHUT-OFF VALVE NW25	21-22-24-84 87-88-89-91-96-111	1	0-03-357-71
207	8082	SET SHUT-OFF VALVE NW32	21-24-34-35-87 88-90-92-95-96-112	1	0-03-357-70
208	8130	SET SIGHT GLASS	51-52-53	1	0-03-357-11
209	8071	SET GASKETS	3-5-7-21-38-45-49 51-57-65-77-88-108	1	0-03-357-31
210	8304	SET CONNECTING ROD	25-26	4	0-03-357-92
211	8158	SET FRONT BEARING	57-58-60-65-76	1	0-00-150-40
212	8157	SET REAR BEARING	38-39-45	1	0-00-150-39
218	8425	SET OIL SUMP HEAT.80W 220-240V	49-101-102-103 117-118-119	1	0-00-233-38
	8429	SET OILS.HEAT 80W 110-130V,SP.	Specific	1	x-xx-xxx-xx
219	8326	SET COMPRESSOR CASING	1	1	x-xx-xxx-xx
290	8456	SET OIL FILTER NOT SHOWN		1	x-xx-xxx-xx

F4



MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

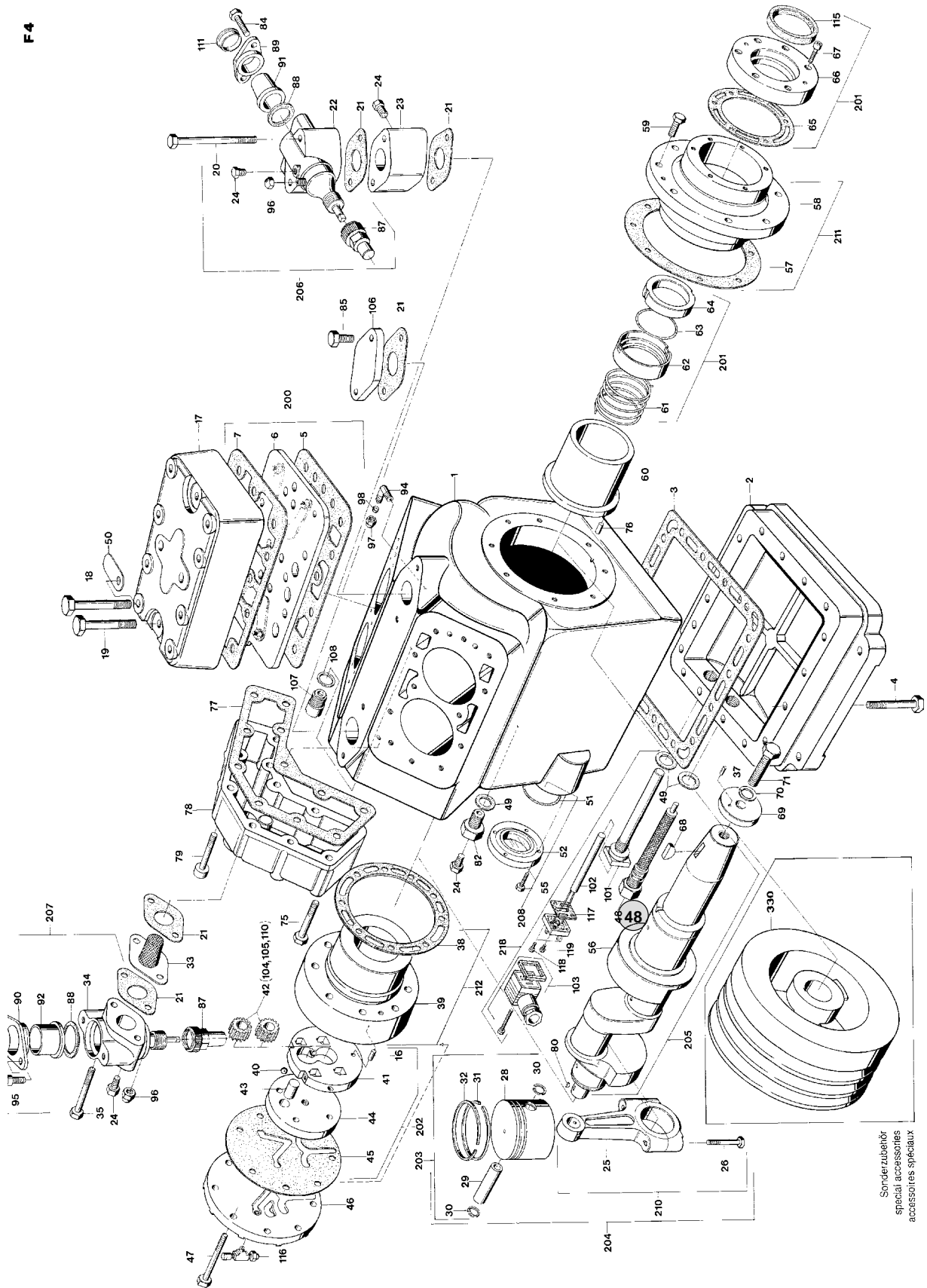
SPECIAL ACCESORIES (NOT SHOWN)

POSITION	CODE	DESCRIPTION	ONLY AVAIL. AS COM. AS. KIT / ITEM	QTY	NOTE
----------	------	-------------	--	-----	------

313	8141	SET START UNL.AL81-4/5 220-240	1	0-03-357-87
314	8574	SET CAP. REG. LR84 220-240V	1	x-xx-xxx-xx
315	8144	SET W-CYLINDER COVER	1	0-03-357-89
316	8146	SET W-CYLINDER COVER F.LR	1	0-03-357-90
330	4188	FLYWHEEL DIA.210 SHOWN IN EXPLODED VIEW	1	x-xx-xxx-xx



F4



8.3 DUAL PRESSURE CONTROLS P78



European Refrigeration Controls Catalogue
Catalog Section **6**
Product Bulletin **P78**
Issue **03/04/2002**

PRODUCT BULLETIN

Series P78

Dual Pressure Controls for Refrigeration, Air-conditioning and Heatpump Applications

Introduction

These dual pressure controls are designed for use in a variety of applications involving refrigeration high or low pressure. Models supplied have a "whole range" design, enabling them to be used with refrigerants R22, R134A, R404A and all other non-corrosive refrigerants which are within the operating range of the control. They may also be used for other high or low pressure applications such as air, water etc. Models which can be used with ammonia as well as controls tested, conforming to DIN 32733, and approved by TÜV are included in the program. DIN models are also tested and approved according to PED 97/23EC Cat. IV

Description

The P78 series pressure controls may be used for control functions or limit functions, depending on model number. All models are provided with alarm contacts (except P78ALA). All standard models have phosphor bronze bellows and brass pressure connections. Models for use with ammonia are provided with stainless steel bellows and connectors. Devices conforming to DIN 32733 have a double bellows on the high pressure versions. Their IP54 classification means that these pressure controls are suitable for almost all applications.



**P78 Dual Pressure Control for
Refrigeration**

Feature and Benefits

<input type="checkbox"/> Generous wiring space	Easy wiring and maintenance
<input type="checkbox"/> Splash-proof enclosure (IP54)	Can be used for indoor/outdoor applications
<input type="checkbox"/> Trip-free manual reset	Override is not possible in the control function
<input type="checkbox"/> Patented separate alarm contacts for both low pressure and high pressure cut-out (except P78ALA)	Easy monitoring of the fault location

Note

The controls are intended to control equipment under normal operating conditions. Where failure or malfunctioning of the controls could lead to an abnormal operating condition that could cause personal injury or damage to the equipment or other property, other devices (limit or safety controls) or systems (alarm or supervisory systems) intended to warn of or protect against failure or malfunctioning of the controls must be incorporated into and maintained as part of the control system.

Note

To facilitate order handling special ordering codes have been added to some commonly used models

Type number matrix

P78LCA	Automatic reset both sides
P78MCA	Automatic reset low side manual reset high side
P78PGA	Manual reset both sides
P78LCW	Automatic reset both sides conform DIN32733, PED 97/23CE
P78MCB	Automatic reset low side manual reset high side conform DIN32733, PED 97/23CE
P78MCS	Automatic reset low side manual reset high side conform DIN32733, PED 97/23CE
P78PGB	Manual reset both sides conform PED 97/23CE
P78PLM	2 x manual reset HP conform DIN32733, PED 97/23CE
P78ALA	Dual fan cycling control (2 x SPST close high)

Adjustment

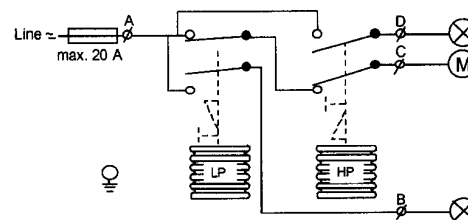
On most models the range scale indicates the high switch point (exception: LP side of P78PGA, P78PGB, here the range scale indicates the low switching point). To obtain low switch point deduct differential value from the high switch point.

Repair and replacement

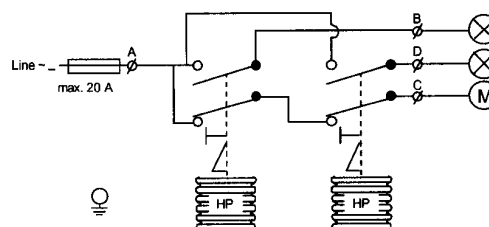
Repair is not possible. In case of an improperly functioning control, please check with your nearest supplier. When contacting the supplier for a replacement you should state the type/model number of the control. This number can be found on the data plate or cover label.

Contact functions

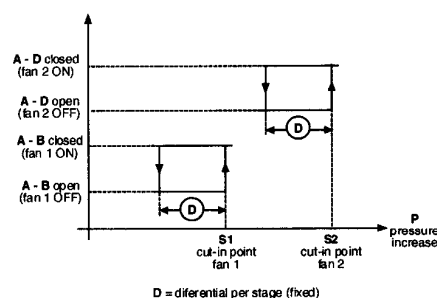
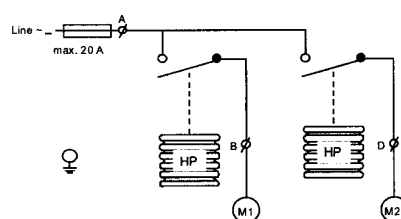
(see also "Type Number Selection" table)



- LP.** A - C opens on pressure decrease
A - B closes simultaneously
- HP.** A - C opens on pressure increase
A - D closes simultaneously

Fig. 1

- Left side HP.** A - C opens on pressure increase
A - B closes simultaneously
- Right side HP.** A - C opens on pressure increase
A - D closes simultaneously

Fig. 2**Switching action P78ALA****Fig.3a****Fig. 3b**

P78
Issue 03/04/2002

3

Type number selection table

Dual pressure controls for Non-corrosive refrigerants. LP Pmax.: 22bar HP Pmax.:33 bar

Family Code	Pressure Connection				Left Side		Right Side		Contact function (Figure)	Construction
	Style 5			Style 30	Range (bar)	Diff. (bar)	Range (bar)	Diff. (bar)		
	Ind. Pack	Code***	Bulk-pack	Ind. Pack						
P78LCA	-9300	P78L	-9320	-9400	-0.5 to 7	0.5 to 3	3 to 30	3 (fixed)	1	LP/HP
P78MCA	-9300	P78M	-9320	-9400	-0.5 to 7	0.5 to 3	3 to 30	Man. res.***	1	

*** Wholesaler code only for individual pack
 ** Resettable at 3 bar below cut-out point
 * Resettable at 0.5 bar above cut-out point

Dual pressure controls for Non-corrosive refrigerants, built in accordance with DIN 32733 and approved by TÜV Germany (Except P78PGB-*). LP Pmax.: 20 bar HP Pmax.:33 bar

Family Code	Pressure Connection				Left Side		Right Side		Contact function (Figure)	Approved according to PED 97/23/EC Cat. IV
	Style 5			Style 28	Range (bar)	Diff. (bar)	Range (bar)	Diff. (bar)		
	Ind. Pack.	Code***	Bulk-pack	Ind. Pack.						
P78LCW	-9300	P78W	-9320	-9800	-0.5 to 7	0.5 to 3	3 to 30	3 (fixed)	1	Yes
P78MCB	-9300	P78B	-9320	-9800	-0.5 to 7	0.5 to 3	3 to 30	Man. res.**	1	Yes
P78MCS	-9300	P78S	-9320	-9800	-0.5 to 7	0.5 to 3	3 to 30	Man. res.**	1	Yes
P78PGB	-9300	P78P	****	-9800	-0.5 to 7	Man. res.*	3 to 30	Man. res.**	1	Yes
P78PLM	-9350	P78BS	****	-9850	3 to 30	Man. res.**	3 to 30	Man. res.**	2	Yes

**** Can be set up for quantity orders
 *** Wholesaler code only for individual pack
 ** Resettable at 3.5 bar below cut-out point
 * Resettable at 0.5 bar above cut-out point

Dual pressure controls for Ammonia and Non-corrosive refrigerants,
 LP Pmax.: 20 bar HP Pmax.:33 bar

Family Code	Pressure Connection				Left Side		Right Side		Contact function (Figure)	Construction
	Style 15			Range (bar)	Diff. (bar)	Range (bar)	Diff. (bar)			
	Ind. Pack.	Code***	Bulk-pack							
P78LCA	-9700		****		-0.5 to 7	0.5 to 3	3 to 30	3 (fixed)	1	LP/HP
P78MCA	-9700		****		-0.5 to 7	0.5 to 3	3 to 30	Man. res. **	1	
P78PGA	-9700		****		-0.5 to 7	Man. res. **	3 to 30	Man. res. **	1	

**** Can be set-up for quantity orders
 *** Wholesaler code only for individual package
 ** Resettable at 3 bar below cut-out point
 * Resettable at 0.5 bar above cut-out point

Dual pressure Fan cycling controls for Air-cooled condensers (Non-corrosive refrigerants)
 HP Pmax.: 30 bar

Family Code	Pressure Connection				Left Side		Right Side		Contact function (Figure)	Construction
	Style 5			Style 30	Range (bar)	Diff. (bar)	Range (bar)	Diff. (bar)		
	Ind. Pack.	Code***	Bulk-pack	Ind. Pack.						
P78ALA	-9351	P78A	****	-9451	3.5 to 21	1.8 (fixed)	3.5 to 21	1.8 (fixed)	3	HP/HP

**** Can be set-up for quantity orders
 *** Wholesaler code only for individual package
 Note: 100 kPa = 1 bar ≈ 14.5 psi

Pressure connections

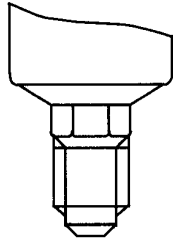


Fig. 4
Style 5
Male connector
7/16"-20 UNF for 1/4"
6 mm flare nut.

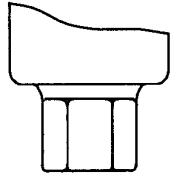


Fig. 5
Style 15
Female connector
1/4"-18 NPT

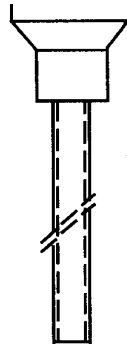


Fig. 6
Style 28
Braze connection
6 mm ODM

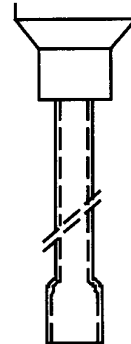


Fig. 7
Style 30
Braze connection
1/4" ODF

Accessories (optional)

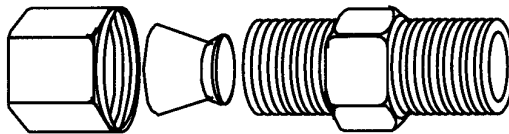


Fig. 8

Description	Application	Order number
Fits into style 15 pressure connectors	For 6 mm copper or steel tubing	CNR003N001R
	For 8 mm copper or steel tubing	CNR003N002R

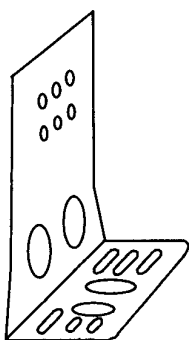


Fig. 9
Mounting bracket
Order number **271-51L**

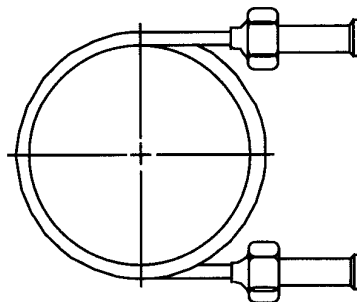


Fig. 10
90 cm Capillary with (2) flare
nuts (1/4" SAE)
Order number **SEC002N600**

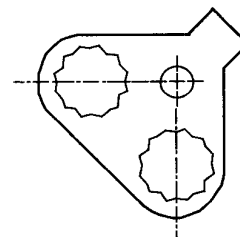
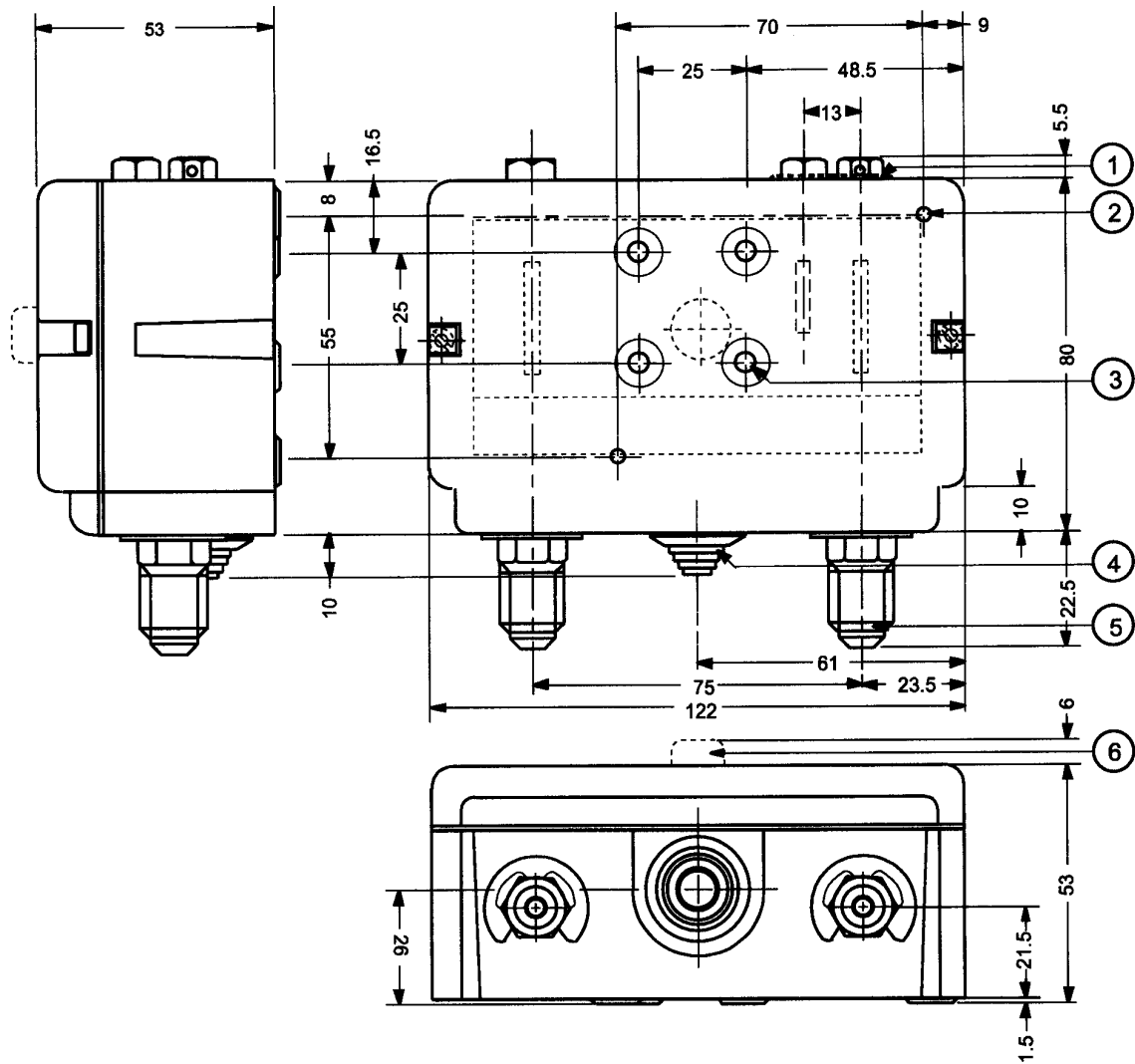


Fig. 11
Locking kit
Order number **KIT023N600**

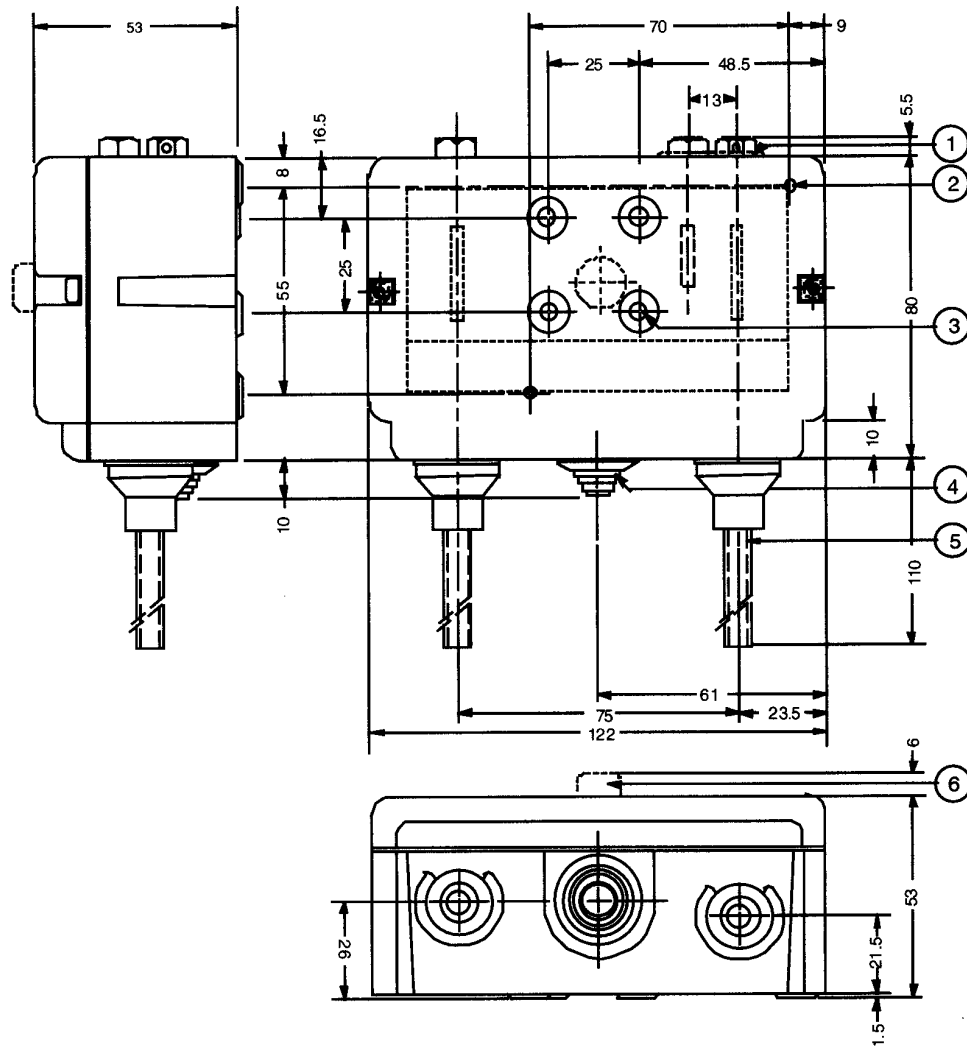
Dimensions (mm)



1. lock plate (if applied)
2. two mounting holes \varnothing 4.5 mm (knock out)
3. four mounting holes \varnothing M4 (back side)
4. cable inlet grommet (cable range \varnothing 5 to \varnothing 13 mm)
5. power element:
Style 5: $\frac{7}{16}$ "-20 UNF male (shown)
Style 15: $\frac{1}{4}$ "-18 NPT female
6. reset button

Fig. 12

Dimensions (mm)



1. lock plate (if applied)
2. two mounting holes Ø 4.5 mm (knock out)
3. four mounting holes Ø M4 (back side)
4. cable inlet grommet (cable range Ø 5 to Ø 13 mm)
5. power element:
Style 28: Braze connection 6 mm ODM (shown)
Style 30: Braze connection 1/4" ODF
6. reset button

Fig. 13

Specifications

Pressure connections	Style 5, 15, 28, 30 (see drawings)			
Operating ranges and diff.	See type number selection			
Adjustments	See type number selection			
Ambient temp. limit	-50 to +55 °C (+70 °C max. duration two hours) -20 to +55 °C for DIN and PED approved models			
Electrical ratings	400 Vac	contact A-C	16(10) A	
		contact A-B	8(5) A	
		contact A-D	8(5) A	
	220 Vdc 12 W (pilot duty only)			
Pulsation plug	Fitted into all HP bellows			
Locking plate and screw	To lock and seal range and/or differential screw. Standard on types P78LCW, MCB, MCS, PGB and PLM. Optional on all other types (quantity orders only)			
Protection Class	IP54			
Material	Case and cover	Weatherproof aluminium (die-cast)		
	Contact unit	Large copper-backed silver cadmium contacts (AgCdO) on conductor leaves		
Accessories (see pag. 4)	Mounting bracket Compression coupling 90 cm capillary with two flare nuts			
Shipping weight	ind. pack	0.8 kg		
	-93xx	{	Ind. overpack	30 pcs. (24.5 kg)
	-97xx		Bulk pack	24 pcs. (19.5 kg)
	-94xx	{	Ind. overpack	13 pcs. (11 kg)
	-98xx			

The performance specifications are nominal and conform to acceptable industry standards. For applications at conditions beyond these specifications, consult the local Johnson Controls office or representative. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.

**JOHNSON
CONTROLS**

Johnson Controls International, Inc.

This document is subject to change

Printed in Europe

Catalogue Section 6

© 2002 Johnson Controls Inc.
Order No. PD-P78-E

8.4 SINGLE PRESSURE CONTROL P77



European Refrigeration Controls Catalogue
Catalog Section **6**
Product Bulletin **P77**
Issue **03/04/2002**

PRODUCT BULLETIN

Series P77

**Single Pressure Controls for Refrigeration,
Air-conditioning and Heatpump Applications**

Introduction

These pressure controls are designed for use in a variety of applications involving refrigeration high or low pressure. Models supplied have a "whole range" design, enabling them to be used with refrigerants R22, R134A, R404A and all other non-corrosive refrigerants which are within the operating range of the control. They may also be used for other high or low pressure applications such as air, water etc. Models which can be used with ammonia as well as controls tested, conforming to DIN 32733, and approved by TÜV are included in the program. DIN (HP) models are also tested and approved according to PED 97/23EC Cat. IV.

Description

The P77 series pressure controls may be used for control functions or limit functions, depending on model number. All models are provided with alarm contacts. All standard models have phosphor bronze bellows and brass pressure connections. Models for use with ammonia are provided with stainless steel bellows and connectors. Devices conforming to DIN 32733 have a double bellows on the high pressure versions. Their IP54 classification means that these pressure controls are suitable for almost all applications.



**P77 Single Pressure Control
for Refrigeration**

Feature and Benefits

<input type="checkbox"/> Generous wiring space	Easy wiring and maintenance
<input type="checkbox"/> Splash-proof enclosure (IP54)	Can be used for indoor/outdoor applications
<input type="checkbox"/> SPDT contacts are provided as standard on single pressure controls.	Can be wired for alarm functions
<input type="checkbox"/> Trip-free manual reset	Override is not possible in the control function

Note

The controls are intended to control equipment under normal operating conditions. Where failure or malfunctioning of the controls could lead to an abnormal operating condition that could cause personal injury or damage to the equipment or other property, other devices (limit or safety controls) or systems (alarm or supervisory systems) intended to warn of or protect against failure or malfunctioning of the controls must be incorporated into and maintained as part of the control system.

Note

To facilitate order handling special ordering codes have been added to some commonly used models

Type number matrix

P77AAA	Automatic reset
P77BCA	Open low - manual reset
P77BEA	Open high - manual reset
P77AAW	HP or LP Limit (Auto. Reset) conforming to DIN 32733
P77BEB	HP Limit (Man. Reset) conforming to DIN 32733, PED 97/23CE
P77BES	HP Safety Limit (Man. Reset) conforming to DIN 32733, PED 97/23CE
P77BCB	LP Limit (manual reset) conforming to DIN 32733

Mounting

Mounting can easily be done with mounting bracket 271-51L (order separately) or directly on a surface. Mounting holes 4,5 mm diam. and M4 holes are provided.

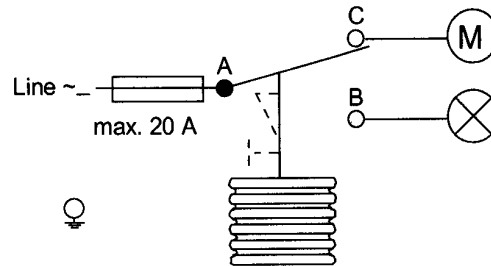
Adjustment

Adjustment of range and differential can be done by turning the hexagonal range screw and differential screw. Manual reset models have a range screw only. The adjustment screw can also be locked by a lock plate accessory (KIT023N600). The lock plate is only included with those devices which are conform to DIN 32733.

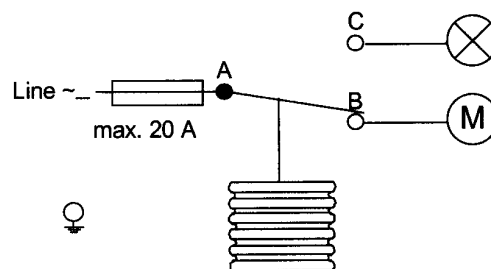
On all models the scale indicates the high switch point (Except type P77BCA, P77BCB, here the scale indicates the low (cut-out) switch point). The low switch point can be derived by deducting the differential value from the high switch point.

Contact functions

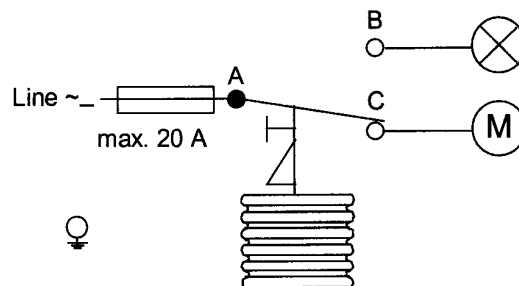
(see also "Type Number Selection" table)



A - C open on pressure decrease
Fig. 1



A - B open on pressure increase
Fig. 2



A - C open on pressure increase
Fig. 3

Optional construction note

If your requirements are not in the type number selection table, then please contact your Johnson Controls representative.

Repair and replacement

Repair is not possible. In case of an improperly functioning control, please check with your nearest supplier. When contacting the supplier for a replacement you should state the type/model number of the control. This number can be found on the data plate or cover label.

P77
Issue 03/04/2002

3

Type number selection table

Pressure controls for Non-corrosive refrigerants

Family Code	Style 5			Style 30	Range (bar)	Diff. (bar)	Contact function (Figure)	Max. Bellows pressure
	Ind. Pack.	Code***	Bulkpack	Ind. Pack.				
P77AAA	-9300	P77L	-9320	-9400	-0.5 to 7	0.5 to 3	1	22
	-9301				-0.2 to 10	1 to 4.5	1	15
	-9302		-9322		-0.3 to 2	0.4 to 1.5	1	4
	-9350	P77H	-9370	-9450	3 to 30	3 to 12	2	33
	-9351	P77A	-9371	-9451	3.5 to 21	2.1 to 5.5	2	30
P77BCA	-9300		-9320	-9400	-0.5 to 7	Man. res.**	1	22
P77BEA	-9350	P77HR	-9370	-9450	3 to 30	Man. res.*	3	33

*** Only individual package

** Resettable at 0.5 bar above cut-out point

* Resettable at 3 bar below cut-out point

Pressure controls for Non-corrosive refrigerants, built in accordance with DIN 32733 and approved by TÜV Germany

Family Code	Style 5			Style 28	Range (bar)	Diff. (bar)	Contact function (Figure)	Max. Bellows pressure	Approved according to PED 97/23EC Cat. IV
	Ind. Pack.	Code***	Bulkpack	Ind. Pack.					
P77AAW	-9300		-9320	-9800	-0.5 to 7	0.5 to 3	1	20	
	-9350	P77W	-9370	-9850	3 to 30	3.5 to 12	2	33	Yes
P77BCB	-9300		-9320	-9800	-0.5 to 7	Man. res.**	1	20	
P77BEB	-9350	P77B	-9370	-9850	3 to 30	Man. res.*	3	33	Yes
P77BES	-9350	P77S	-9370	-9850	3 to 30	Man. res.*	3	33	Yes

*** Only individual package

** Resettable at 0.5 bar above cut-out point

* Resettable at 3.5 bar below cut-out point

Pressure controls for Ammonia and Non-corrosive refrigerants, built in accordance with DIN 32733 and approved by TÜV Germany

Family Code	Style 15		Range (bar)	Diff. (bar)	Contact function (Figure)	Max. Bellows pressure	Approved according to PED 97/23EC Cat. IV
	Ind. Pack.	Bulkpack					
P77AAW	-9700		-0.5 to 7	0.5 to 3	1	20	
	-9750		3 to 30	3.5 to 12	2	33	Yes
P77BCB	-9700		-0.5 to 7	Man. res.**	1	20	
P77BEB	-9750		3 to 30	Man. res.*	3	33	Yes
P77BES	-9750		3 to 30	Man. res.*	3	33	Yes

** Resettable at 0.5 bar above cut-out point

* Resettable at 3.5 bar below cut-out point

Pressure controls for Ammonia and Non-corrosive refrigerants

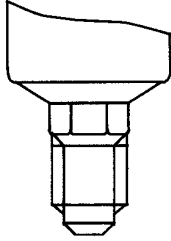
Family Code	Style 15		Range (bar)	Diff. (bar)	Contact function (Figure)	Max. Bellows pressure
	Ind. Pack.	Bulkpack				
P77AAA	-9700		-0.5 to 7	0.5 to 3	1	20
	-9750	-9770	3 to 30	3.5 to 12	2	33
P77BCA	-9700		-0.5 to 7	Man. res.**	1	20
P77BEA	-9750		3 to 30	Man. res.*	3	33

** Resettable at 0.5 bar above cut-out point

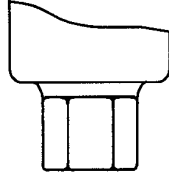
* Resettable at 3 bar below cut-out point

Note: 100 kPa = 1 bar ≈ 14.5 psi

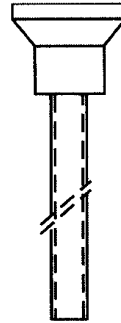
Pressure connections



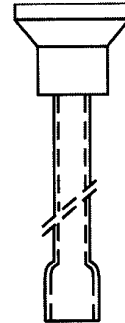
**Fig. 4
Style 5**
Male connector
7/16\"-20 UNF for 1/4\"
6 mm flare nut.



**Fig. 5
Style 15**
Female connector
1/4\"-18 NPT



**Fig. 6
Style 28**
Braze connection
6 mm ODM



**Fig. 7
Style 30**
Braze connection
1/4\" ODF

Accessories (optional)

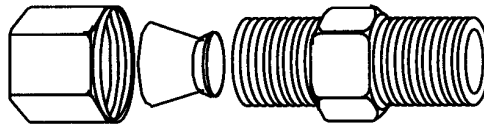


Fig. 8

Description	Application	Order number
Fits into style 15 pressure connectors	For 6 mm copper or steel tubing	CNR003N001R
	For 8 mm copper or steel tubing	CNR003N002R

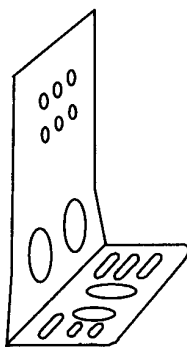


Fig. 9
Mounting bracket
Order number **271-51L**

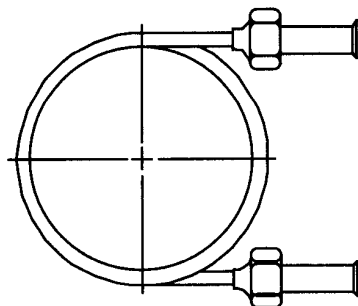


Fig. 10
90 cm Capillary with (2) flare
nuts (1/4\" SAE)
Order number **SEC002N600**

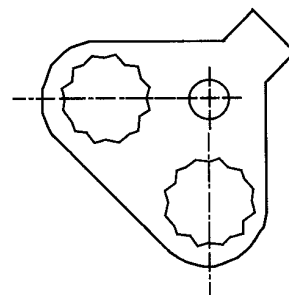
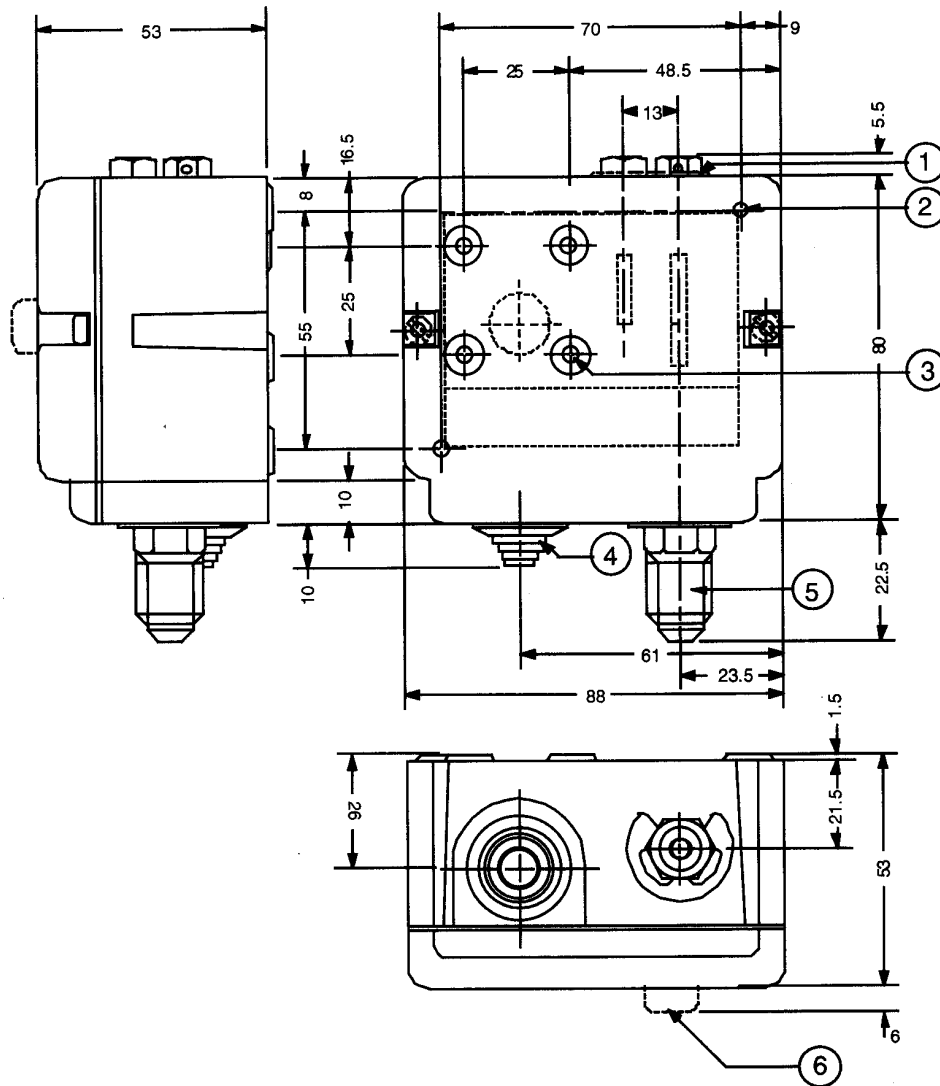


Fig. 11
Locking kit
Order number **KIT023N600**

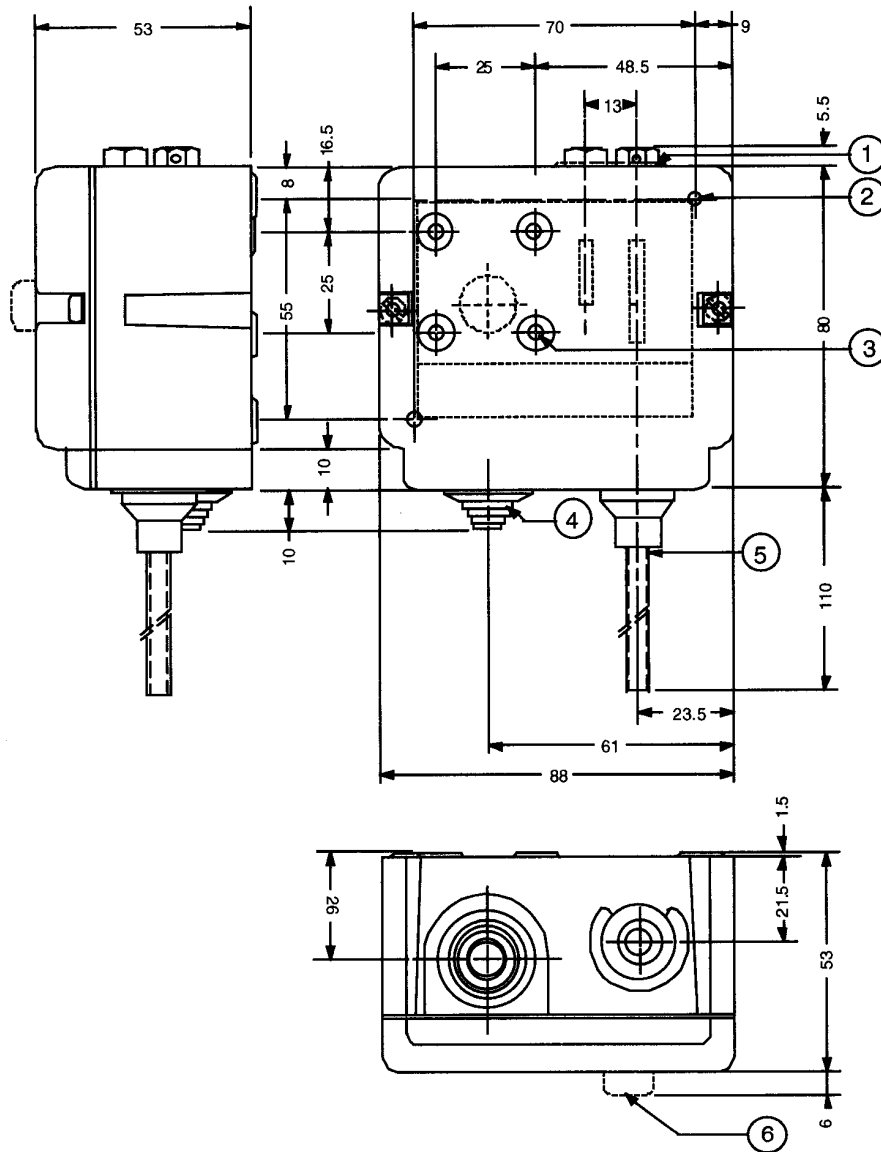
Dimensions (mm)



1. lock plate (if applied)
2. two mounting holes Ø 4.5 mm (knock out)
3. four mounting holes Ø M4 (back side)
4. cable inlet grommet (cable range Ø 5 to Ø 13 mm)
5. power element:
Style 5: $\frac{7}{16}$ "-20 UNF male (shown)
Style 15: $\frac{1}{4}$ "-18 NPT female
6. reset button

Fig. 12

Dimensions (mm)



1. lock plate (if applied)
2. two mounting holes Ø 4.5 mm (knock out)
3. four mounting holes Ø M4 (back side)
4. cable inlet grommet (cable range Ø 5 to Ø 13 mm)
5. power element:
Style 28: Braze connection 6 mm ODM (shown)
Style 30: Braze connection 1/4" ODF
6. reset button

Fig. 13

Specifications

Pressure connections	Style 5, 15, 28, 30 (see drawings)		
Operating ranges and diff.	See type number selection		
Adjustments	See type number selection		
Ambient temp. limit	-50 to +55 °C (+70 °C max. duration two hours) -20 to +55 °C for DIN and PED approved models		
Electrical ratings	400 Vac 16(10) A 220 Vdc 12 W (pilot duty only)		
Pulsation plug	Fitted into all HP bellows on models with range 3.5 to 21 bar and up		
Locking plate and screw	To lock and seal range and/or differential screw. Standard on types P77AAW, BEB, BES and BCB. Optional on all other types (quantity orders only)		
Protection Class	IP54		
Material	Case and cover	Weatherproof aluminium (die-cast)	
	Contact unit	Large copper-backed silver cadmium contacts (AgCdO) on conductor leaves	
Accessories (see pag. 4)	Mounting bracket Compression coupling 90 cm capillary with two flare nuts		
Shipping weight	ind. pack	0.5 kg	
	-93xx	{	Ind. overpack 40 pcs. (21 kg)
	-97xx		Bulk pack 35 pcs. (18 kg)
	-94xx	{	Ind. overpack 16 pcs. (9 kg)
	-98xx		

The performance specifications are nominal and conform to acceptable industry standards. For applications at conditions beyond these specifications, consult the local Johnson Controls office or representative. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.

**JOHNSON
CONTROLS**
Johnson Controls International, Inc.

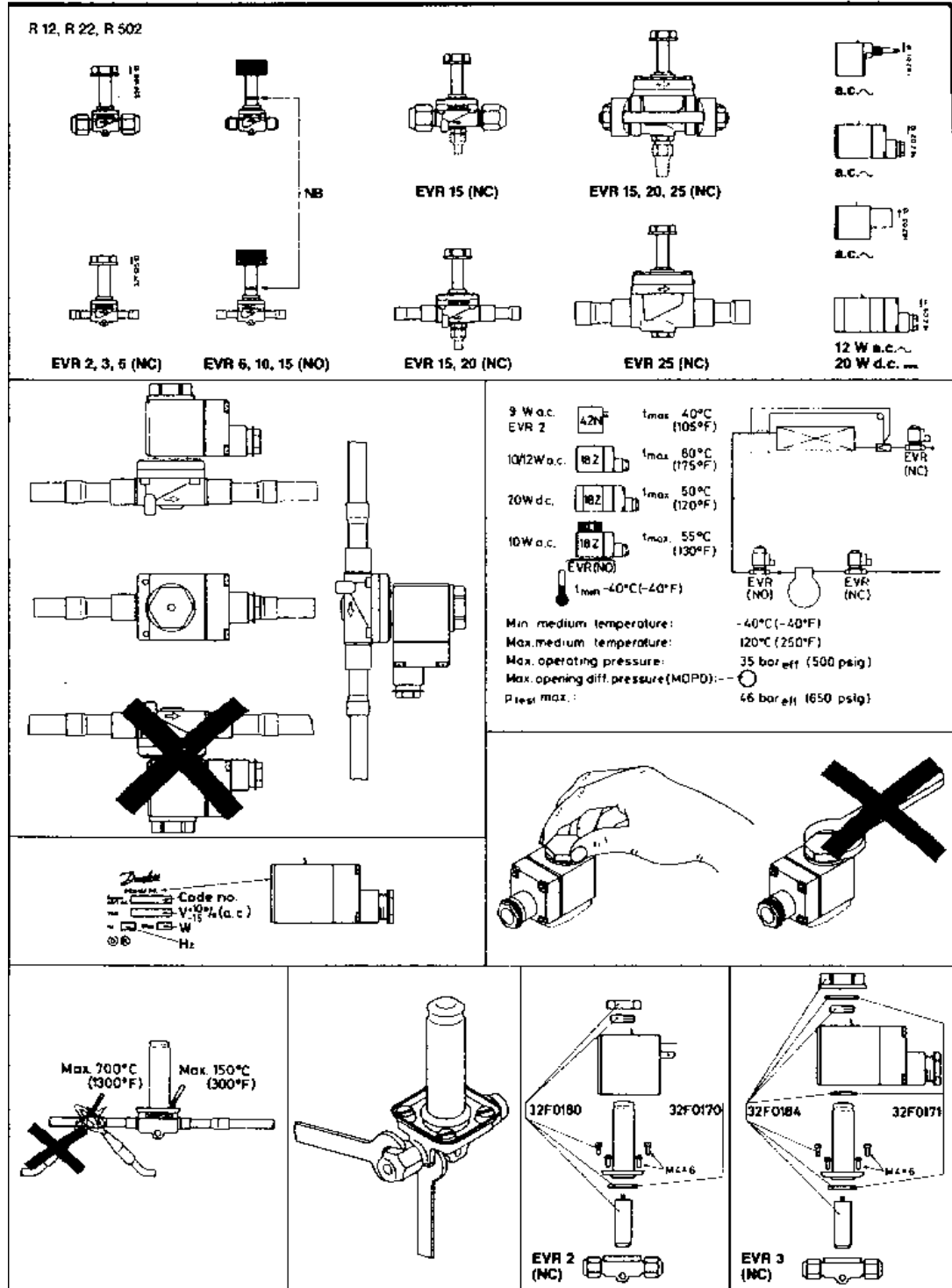
This document is subject to change

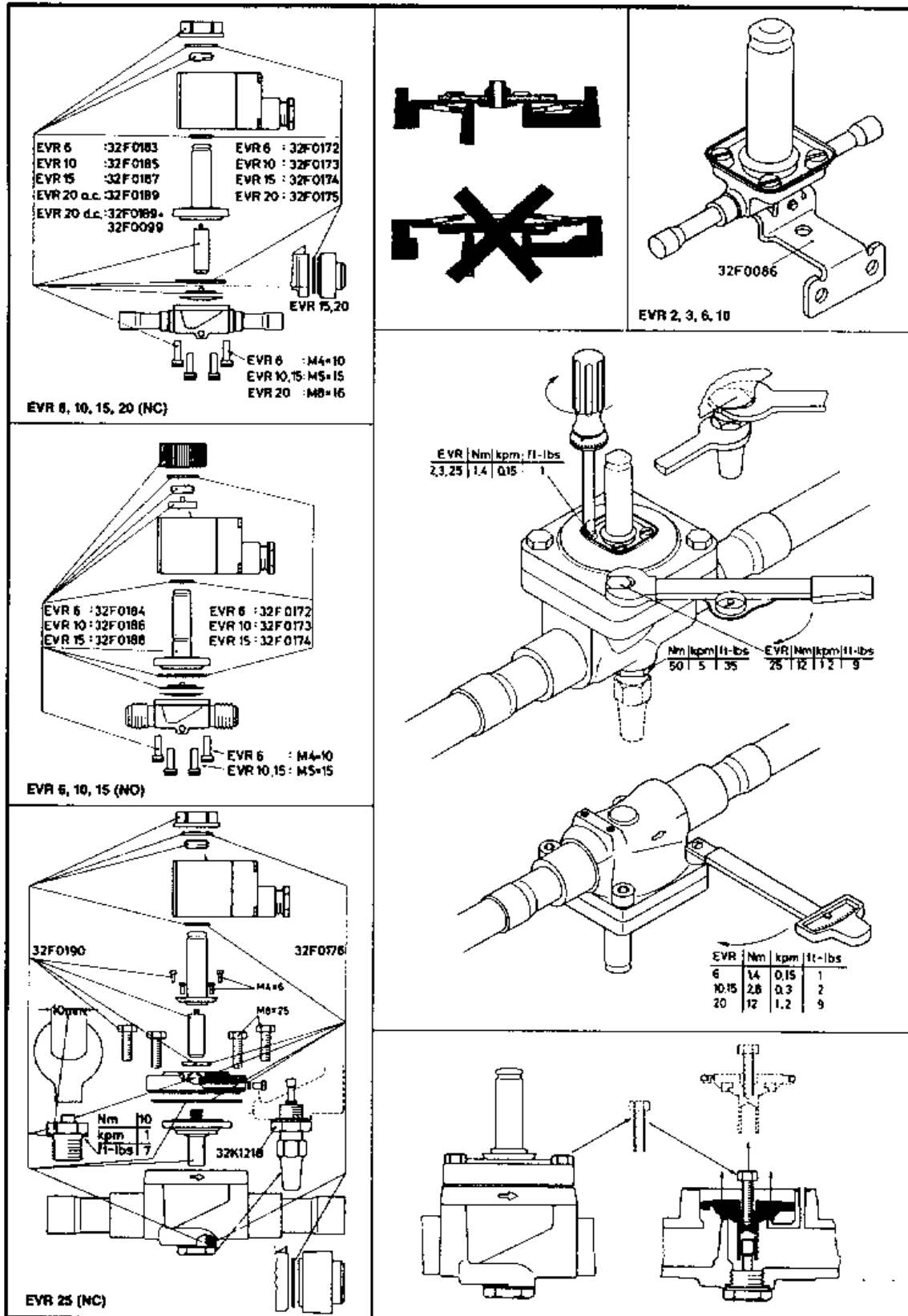
Printed in Europe

Catalogue Section 6

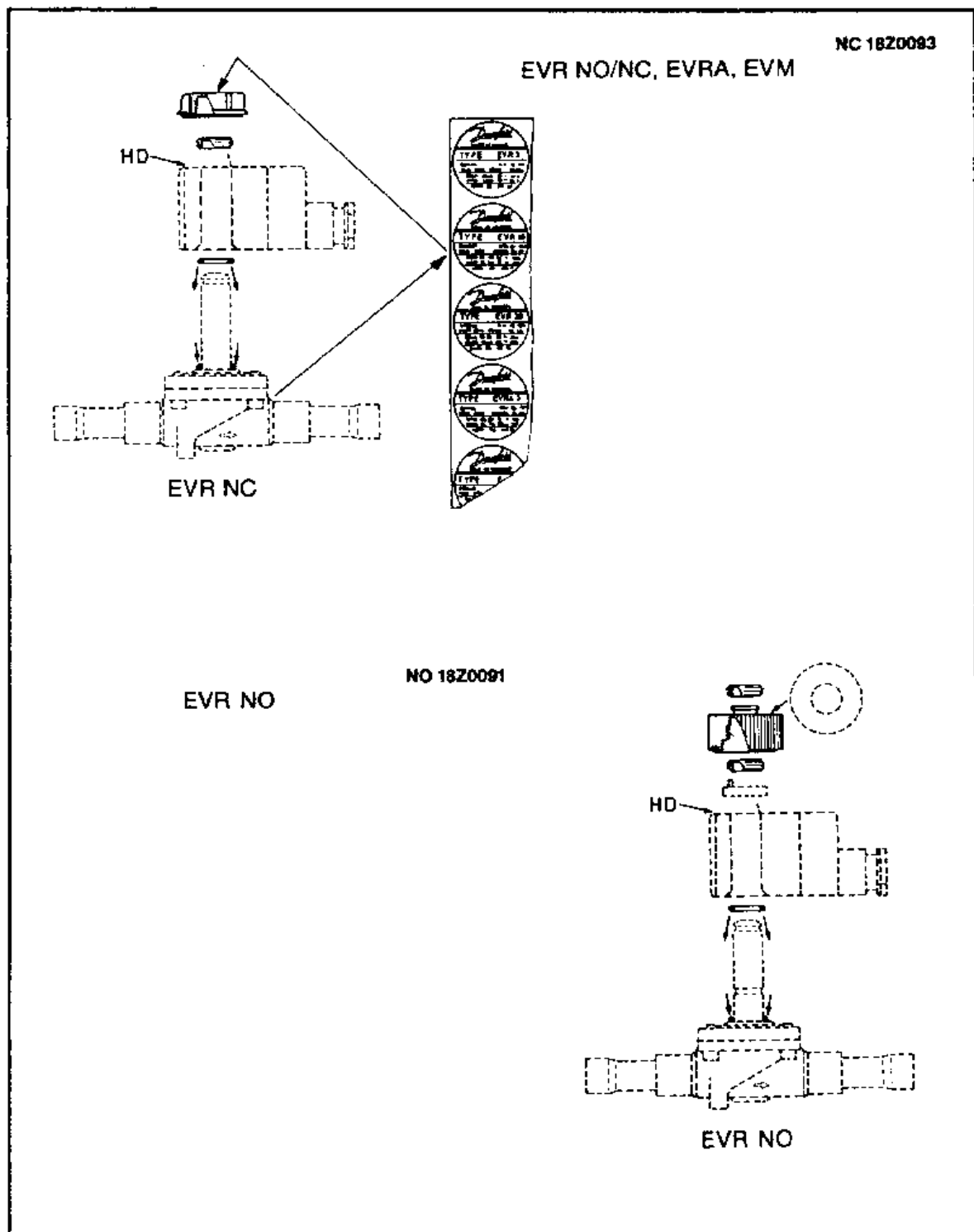
© 2002 Johnson Controls Inc
Order No. PD-P77-E

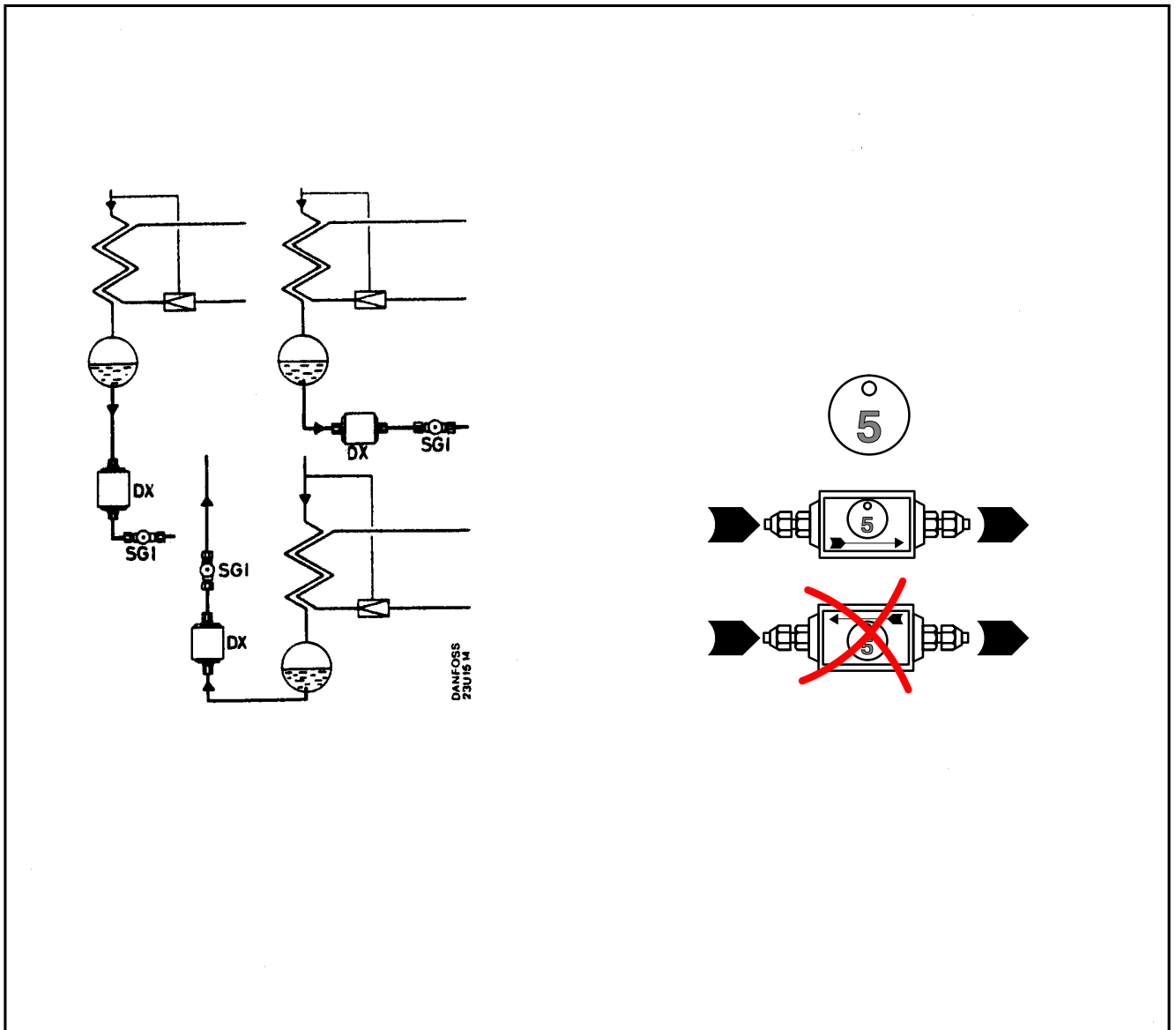
8.5 ELECTROMAGNETIC VALVE EVR





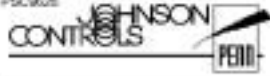
SEAL KIT



8.6 DESHYDRATOR DX / DN / DCL ... 164 / 165

8.7 THERMOSTAT A28

PSC9025



European Refrigeration Controls Catalogue
Catalog Section 1
Product Bulletin A28
Issue 0103

Series A28 Two stage Thermostats

Introduction

These thermostats are designed for various types of heating, cooling, ventilation, or air-conditioning applications. All models have two SPDT switches providing the following control possibilities:

- 2 stage heating
- 2 stage cooling
- heating/cooling with automatic changeover

Models are provided with a standard IP30 case or splashproof, dust-tight IP65 plastic case

Description

Controls are compact with fixed differential per stage and (on most models) adjustable differential between stages. Liquid filled element provides wide range, constant differential over whole range and no influence from barometric pressure. Since the bulb contains the major portion of the total fill the thermostat may be considered as cross-ambient, capillary and cup temperature variations affect the operating point only slightly due to the small amount of fill they contain.

For quantity orders it is possible to have the below stated optional constructions

- Without case and cover for panelmounting
- Close differential per stage
- Different capillary lengths

All standard IP30 enclosure models have a universal way of adjustment. For this purpose a knob and sealing cap are enclosed.



A28QA
splashproof dust-tight thermostat with 2m capillary and style 1b bulb (left).

A28AA
thermostat with style 3 element (right).

Feature and Benefits

<input type="checkbox"/> Liquid filled sensing element	No cross ambient temperature problems Constant differential over the whole range
<input type="checkbox"/> Dust tight Penn switch	Prevents pollution of the contacts by electrostatic influences.
<input type="checkbox"/> IP65 protection class models available	Suitable for outdoor applications
<input type="checkbox"/> Front adjustment	Less mounting space required

Note

These controls are designed for use only as operating controls. Where an operating control failure would result in personal injury or loss of property it is the responsibility of the installer to add devices or systems that protect against, or warn of, control failure.

Adjustment

Models "set low" (see also cover label):
The dial indicates the switch point "SP1" (see switching diagram).

Models "set high" (see also cover label):
The dial indicates the switch point "SP2" (see switching diagram).

For IP30 models the standard screwdriver adjustment can be converted easily in the field to knob adjustment. Also concealing of adjustment is possible after installation.

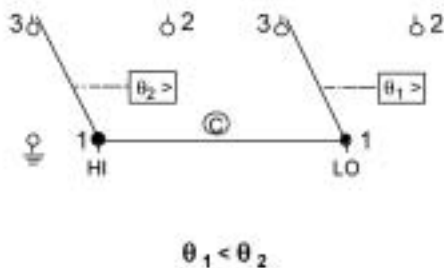
Contact function

Fig. 1

1-2 closes on temperature increase.
C Removable jumper.

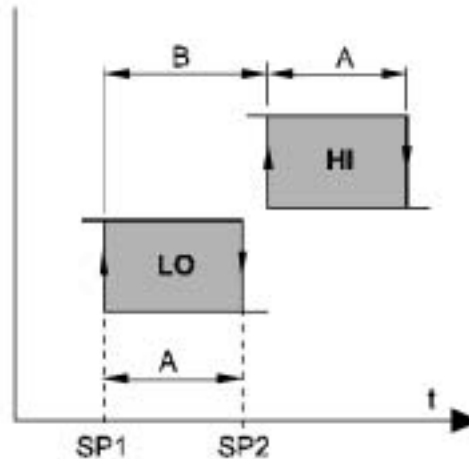
Switching diagram (Heating Mode)

Fig.2

- A Differential per stage.
- B Differential between the stages.
- SP1 Dial setting (for exceptions see 'SP2').
- SP2 Dial setting (range 0 to 43°C and 1 to 60°C).
- t Temperature increase.
- LO Low stage.
- HI High stage.

Repair and Replacement

Repair is not possible. In case of an improperly functioning control, please check with your nearest supplier. When contacting the supplier for a replacement you should state the type/model number of the control. This number can be found on the data plate or cover label.

A28
Issue 0103

3

Type number selection table:

Range (°C)	Diff. per stage (K)	Diff. between stages (K)	Element style (cap. length)	Bulb size (mm)	Element finish	Setting (see page 2 adjustment)	Max. bulb temp (°C)	Bulb well (optional)	Order number
------------	---------------------	--------------------------	-----------------------------	----------------	----------------	---------------------------------	---------------------	----------------------	--------------

Type A28AA Capillary Thermostats, General Purpose IP30

-35 to +10	2	1 to 4	1b(2m)	9.5 x 110	Tin-plated	set low	60	WEL14A802R	A28AA-9006
-5 to +28	1.5	1 to 4	1b(2m)	9.5 x 135	Tin-plated	set low	60	WEL14A803R	A28AA-9007
-5 to +28	1.5	1 to 4	1b(5m)	9.5 x 135	Tin-plated	set low	60	WEL14A803R	A28AA-9186
1 to 60	2	1 to 4	1b(3m)	9.5 x 115	-	set high	85	WEL14A802R	A28AA-9118

Type A28AA Space thermostat

0 to +43	1.5	1 to 4	2	-	St. Steel	set high	60	-	A28AA-9113
----------	-----	--------	---	---	-----------	----------	----	---	------------

Type A28QA Capillary Thermostats, Splashproof IP65, Dust-tight Case

-35 to +10	2	1 to 4	1b(2m)	9.5 x 110	Tin-plated	set low	60	WEL14A802R	A28QA-9110
-5 to +28	1.5	1 to 4	1b(2m)	9.5 x 135	Tin-plated	set low	60	WEL14A803R	A28QA-9111
-35 to +40	2	1 to 4	1b(3.5m)	9.5 x 110	Tin-plated	set low	60	WEL14A802R	A28QA-9114
1 to 60	2	1 to 4	1b(3m)	9.5 x 115	-	set high	60	WEL14A802R	A28QA-9115

Type A28QA Space Thermostats, Splashproof IP65, Dust-tight Case

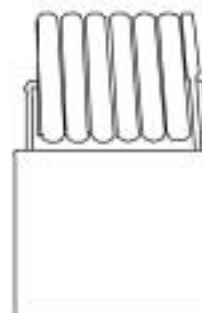
0 to +43	1.5	1 to 4	3	-	St. Steel	set high	60	-	A28QA-9113
----------	-----	--------	---	---	-----------	----------	----	---	------------

**Type A28QA Capillary Thermostats, Splashproof IP65, Dust-tight Case, Concealed adjustment.
For use on cooling-towers evaporative condensers, or air cooled condensers**

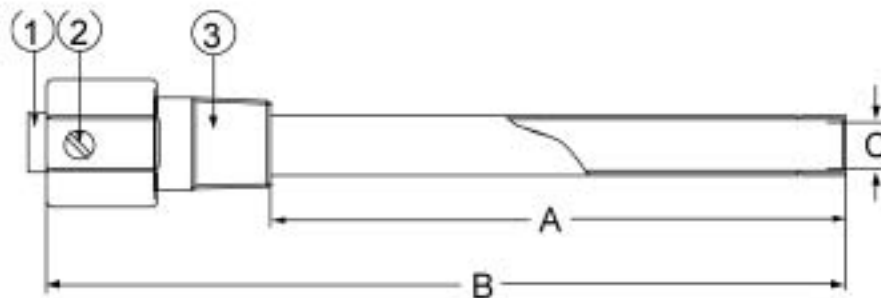
5 to 50	2	4	1b(2m)	9.5 x 110	St. Steel	set low	103	WEL14A802R	A28QA-9101
---------	---	---	--------	-----------	-----------	---------	-----	------------	------------

**Type A28QJ Capillary Thermostats, Splashproof IP65, Dust-tight Case
For use on heat pumps and heat recovery units**

10 to 95	1.5	1 to 4	1b(2m)	9.5 x 100	-	set low	115	WEL14A802R	A28QJ-9100
----------	-----	--------	--------	-----------	---	---------	-----	------------	------------

Note: If what you need is not in the specific type numbering selection table then please contact your representative**S**ensor styles**Fig. 3
Style 1b**swaged bulb, can be used with closed-tank
connector FTG13A-600**Fig. 4
Style 3 (coil)**

Accessories (optional)



Order no.	Dimension A	Dimension B	Dimension C Internal
WEL14A602R	125 mm	171 mm	9.8 mm
WEL14A603R	147 mm	193 mm	9.8 mm

1. Bushing
 2. Set screw
 3. Adapter, 1/2"-14 NPT
- Bulb well (brass, copper pipe)

Fig. 5

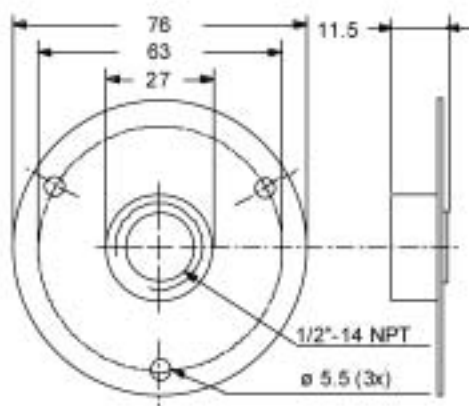
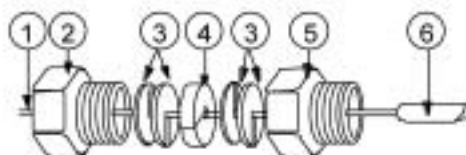


Fig. 6

Duct flange to be used with closed-tank connector FTG13A600R.
Order number T-752-1001



1. Style 1b bulb support tube
2. Packing nut
3. Washer
4. Packing
5. Adapter, 1/2"-14 NPT
6. Bulb

Fig. 7

Closed-tank connector
Order number FTG13A600R

Technical drawing of the 1000 Series Locking Device, showing front, side, and detail views with dimensions in millimeters.

Front View Dimensions:

- Overall width: 55 mm
- Distance from left edge to center of top handle: 40 mm
- Distance from left edge to center of bottom handle: 3.6 mm
- Distance from left edge to center of lock body: 13 mm
- Distance from left edge to center of lock body (alternative): 21.5 mm
- Distance from top handle to center of lock body: 19 mm
- Distance from bottom handle to center of lock body: 19 mm
- Distance from center of lock body to left edge: 7 mm
- Distance from center of lock body to right edge: 13 mm
- Overall height: 125 mm

Side View Dimensions:

- Overall width: 46.5 mm
- Distance from top edge to center of lock body: 28 mm
- Distance from center of lock body to bottom edge: 16 mm
- Distance from left edge to center of lock body: 6 mm

Detail View Dimensions:

- Distance from top edge to center of lock body: 32 mm
- Distance from center of lock body to bottom edge: 75 mm
- Distance from left edge to center of lock body: 13 mm
- Distance from center of lock body to right edge: 13 mm

- 1 Reset lever
- 2 Knob packed separately with the control
- 3 22.3 mm dia. cable inlet hole for PG-16
- 4 Earth screw

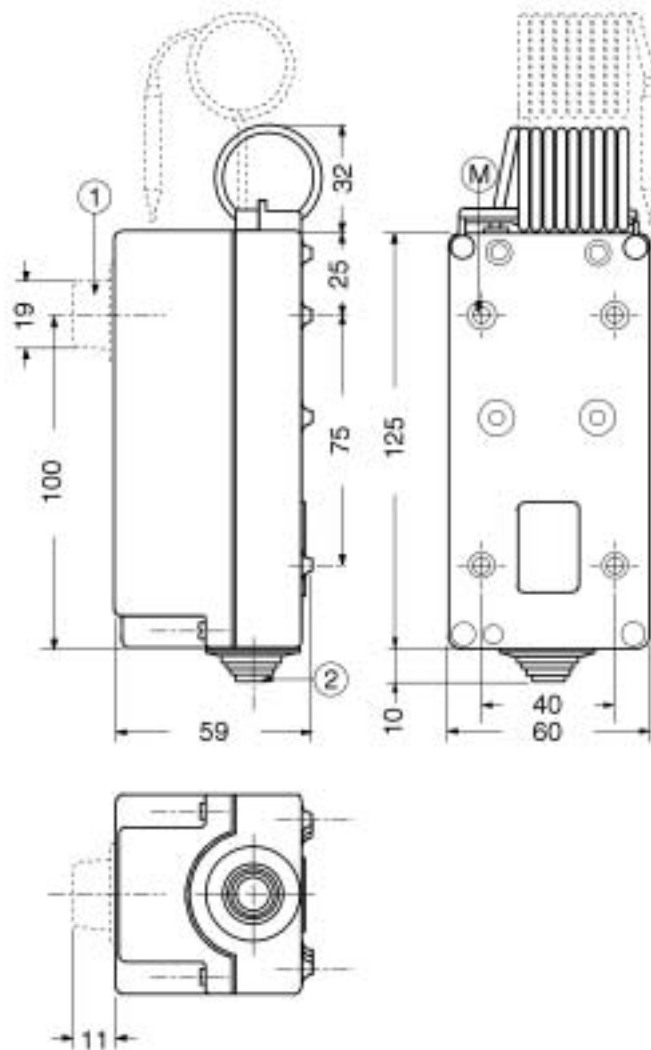
Dimensions (mm)

Fig. 9
A28QA/QJ (splash-proof IP65, dust-tight enclosure)

- 1** Knob (knob models only)
- 2** Cable grommet \varnothing 5 to \varnothing 13 mm
- M** 4 Mounting holes \varnothing 4.5 mm use 2 holes only

MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

A28
Issue 0103

7

Notes

© 2001 Johnson Controls Inc.
Order No. PD-A28-E

Catalogue Section 1



Specifications

Type number		A28AA (standard IP30 enclosure)	A28QA/QJ (splashproof, dust-tight IP65 enclosure)		
Element style		Style 1b bulb element	Style 3	Style 1b bulb element	Style 3
Application		General purpose -	Space -	General purpose Cooling towers and air-cooled condensers	Space (out-door and agriculture) -
Operating ranges		See type number selection table			
Differentials		See type number selection table			
Adjustment		Universal	-	External knob (general purpose) Concealed under cover (cooling-tower and air-cooled condensers)	
		Controls with adjustable differential between stages have an adjustment lever under the cover			
Material Case Cover		1.75 mm cold-rolled zinc plated steel 1.5 mm ABS plastic		Polycarbonate Blue-colour finish Polycarbonate Blue-colour finish	
Conduit opening		22.3 mm dia. hole for PG16		Cable grommet. Conduit opening also applicable for PG16 connector	
Amb. temp. limits		-35 to +55°C		-35 to +55°C	
CE Conformity		According to low voltage directive and		EMC directive	
Electrical ratings		~15(5)A 230V		~15(5)A 230V (A28QJ: ~15(3)A) 230V)	
Enclosure		IP30		IP65	
Shipping weight	ind. pack	0.4 kg		0.5 kg	
	overpack	10 kg (24 pcs.)		12 kg (24 pcs.)	


The performance specifications are nominal and conform to acceptable industry standards. For applications at conditions beyond these specifications, consult the local Johnson Controls office or representative. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.




Johnson Controls International, Inc.
 Headquarters: Milwaukee, WI, USA
 European Headquarters: Westendhof 8, 45143 Essen, Germany
 European Factories: Lomagna (Italy), Leerswanden (The Netherlands) and Essen (Germany)
 Branch Offices: Principal European Cities
 This document is subject to change

Printed in Europe

8.8 THERMOSTAT KP77




INSTRUCTIONS




KP 61 → 81

066R9758


KP 61, 62, 63, 68, 69 vapour charge
 KP 62, 71, 73, 75, 77, 79, 81 adsorption charge (cross ambient)




Vapour charge



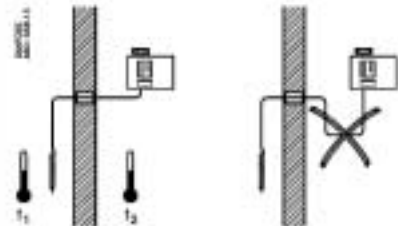
Adsorption charge



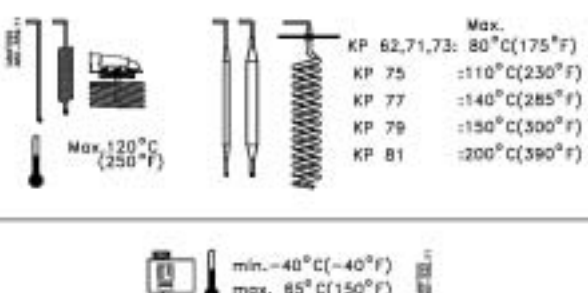
Manual reset



µ-stop

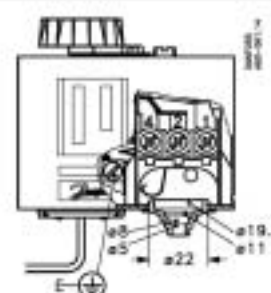



$t_2 \geq t_1 + 2^\circ\text{C} (3.5^\circ\text{F})$
Vapour charge



Model	Max. Temp.
KP 62, 71, 73	80°C (175°F)
KP 75	110°C (230°F)
KP 77	140°C (285°F)
KP 79	150°C (300°F)
KP 81	200°C (390°F)

min. -40°C (-40°F)
max. 85°C (150°F)





2m cap. type 3 AB ≥ 40cm
 5m cap. type 3 AB ≥ 55cm

Electrical rating - General

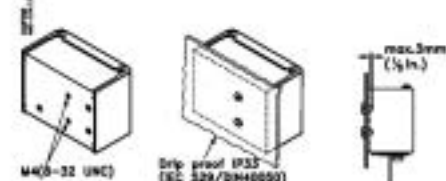
LR 112A	AC 1: 16A AC 3: 16A AC 11: 10 A	DC 11 12 W 220 V~
---------	---------------------------------------	-------------------------

When used acc. to UL regulations


UL Listed refrigeration controller 61B5

Voltage	FL	LR	Resist. load	Pilot duty
240	8	4.8	8A	3 A
120	16	9.6	16A	
240				12W

Use copper wire only
 Tightening torque 20 lb. in.



M40-32 UNC Drip proof IP33 (EC 529/2006/EEC)



Start Diff Stop Diff


066R9758

© Danfoss A/S
RI.5D.B3.02 03 - 2000

REV. 00

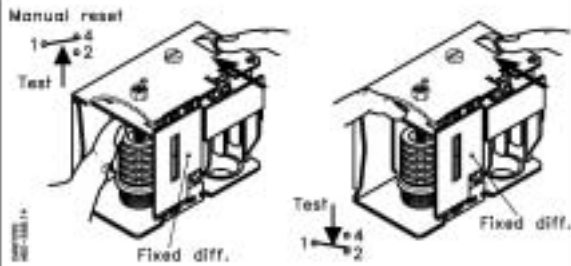
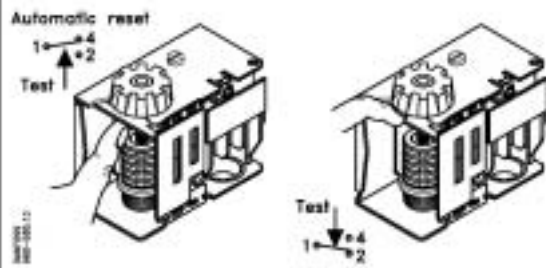
1-10-961-16

When fulfilled, this document is the property of E.C.L.

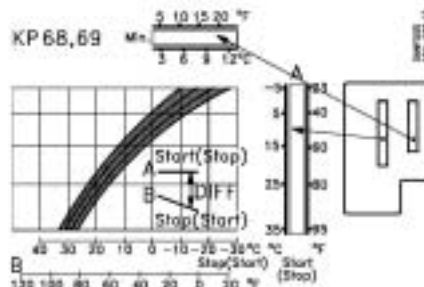
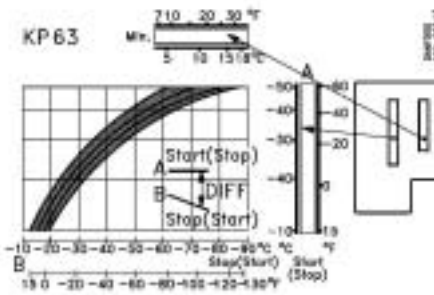
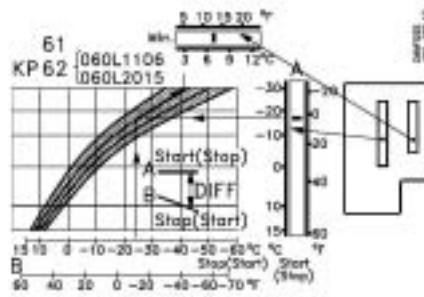
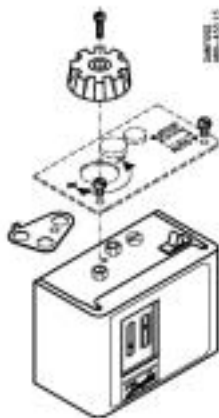


and may not be reproduced without written permission.

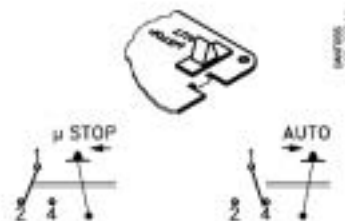
8.8-1



KP 61	060L1104, 060L1105	diff. = 3°C (5.4°F)
KP 71	060L1115	diff. = 3°C (5.4°F)
KP 73	060L1138	diff. = 3.5°C (6.3°F)



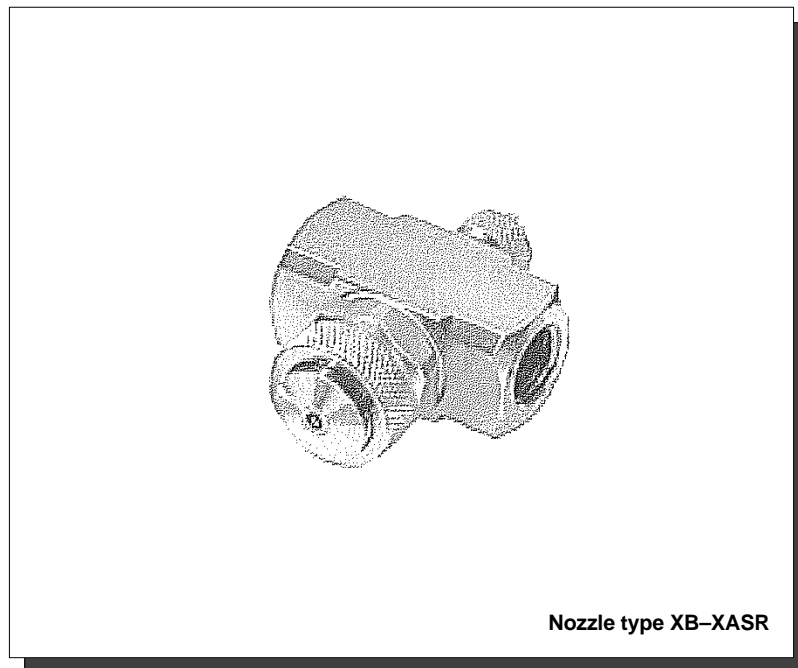
Vapour charge



KP 61	060L1103, 1128	Vapour charge
KP 62	060L1110	Adsorption charge
KP 73	060L1118	Adsorption charge

8.9 ATOMISATION – NOZZLE TYPE XB–XASR

Location	Item	ECL Code	Reference
Cabin assembly / Pneumatic equipment (1–10–198–03)	13	1–10–369–55	XB–XASR



SETTING FOR THE WATER CONDENSATE ATOMIZER OF THE PNEUMATIC EQUIPMENT

The maximum suction height is 200 mm with the model XB–XASR.

The working pressure, with this height for the cabin air conditioning unit is 1.5 bar.

With these conditions, the system is able to atomise 10.8 l/h of water with a calculated consumption of compressed air of 3.48 Nm³ /h or 60 l/min.

In case of water dripping from the overfill hose, increase the working pressure to 2 bars to increase the atomisation capacity (and then the air consumption).

Check the good operation of the atomiser, water fog from the nozzle and check for any leakage from the water suction pipe.

It is **NECESSARY** to not increase the height of the atomizer relative to the water tank to avoid a drop in the atomizer efficiency. As an example, a 300 mm increase of this height reduces the atomisation capacity to 2.8 l/h.

In that case, it is impossible to vaporise all the condensate produced by the air conditioning unit (6 to 10 l/h depending on atmospheric conditions)

8.10 SPARE PARTS FOR COMPRESSOR F3 / FX3

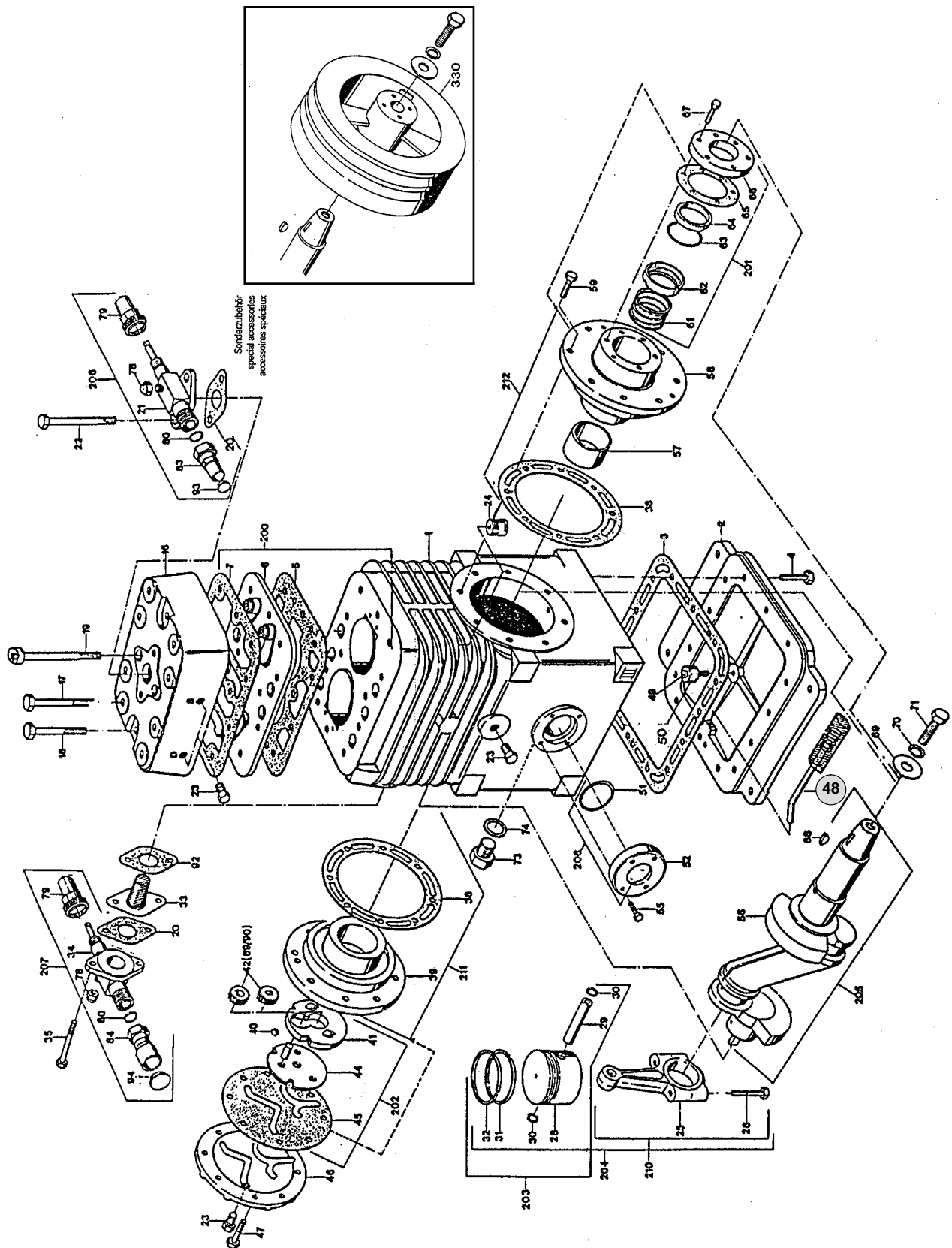
LOCATION	DESIGNATION	ECL CODE (A/C UNIT)	COMPRESSOR	ECL CODE
Air conditioning units of the Electric panel (Machine Type I)	FR42 MEV	0-06-092-32	BOCK F3	0-05-320-82

**BOCK F3 COMPRESSOR**

MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

Nr	DESCRIPTION	QTY	CODE	REF.	STOCK Nr
1	Compressor casing	1		04012	
2	Base plate	1		04035	
3	Base plate gasket	1		05045	
4	Hex.head screw M8x25	14		05421	
5	Lower valve plategasket	1		05028	
6	Valve plate –alone–	1		07149	
7	Upper valve plate gasket	1		05010	
16	Cylinder cover	1		04084	
17	Hex. head screw M10x75	8		06828	
18	Hex. head screw M10x65	2		06820	
19	Hex. socket head screw	2		06644	
20	Valve flange gasket	2		05082	
21	Shuf-off valve less sold.	1		07373	
22	Hex. head screw M10x30	2		05846	
23	Locking screw NPT 1/8"	4		05514	
24	Sleeve for pressure balance	2		05301	
25	Connecting rod, short CPL.	2		04481	
26	Hex. head screw M6x30	4		05516	
28	Piston dia.55	2		07111	
29	Piston pin dia.15	2		07212	
30	Seeger circlip 15x1	4		05551	
31	Ring tab piston 55	2		05390	
32	Ring compression piston 55	2		05380	
33	Filter, suction side	1		03370	
34	Shuf-off valve less sold.	1		07373	
35	Hex. head screw M10x30	2		05846	
38	Rear bearing flange gasket	2		05056	
39	Bearing flange, rear	1		04129	
40	Steel ball dia.5,56	4		05565	
41	Pump-casing	1		04380	
42	Set gear wheel	1		05327	
44	Pump plate	1		05330	
45	Cover plate gasket	1		05077	
46	Cover plate	1		04164	
47	Hex. head screw M8x30	8		05423	
48	Filter, base plate compl.	1		04435	
49	Hex. head screw M5x8	1		06763	
50	Disc Dia.5,3x25x1,25	1		06762	
51	Ring-O dia.34,59x2,62	1		05153	
52	Sight glass plate	1		06001	
55	Hex. head screw M6x16	4		05402	
56	Crank shaft 49 stroke	1		07221	
57	Bearing D.34 x 25	1		05373	
58	Bearing flange, front	1		04139	
59	Hex. head screw M8x20	8		05419	
61	Compression spring	1		05186	
62	Ring guide	1		05289	
63	Ring-O dia.25x3,53	1		05157	
64	Ring slip	1		05139	
65	Shaft seal cover gasket	1		05062	
66	Shaft seal cover	1		04306	
67	Hex. head screw M5x20	6		05401	
68	Woodruff key A4x6,5	1		05671	
69	Washer dia.24x8,4x3	1		05659	
70	Spring washer A8	1		05663	
71	Hex. head screw M8x25	1		05421	
72	Flywheel dia.210 (see item 330)	1		04186	
73	Stopper M22x1,5 f.oil	1		06400	
74	Copper disc dia.27x22x2	1		05342	
78	Cap nut UNF 7/16"	2		05789	



MA'ADEN

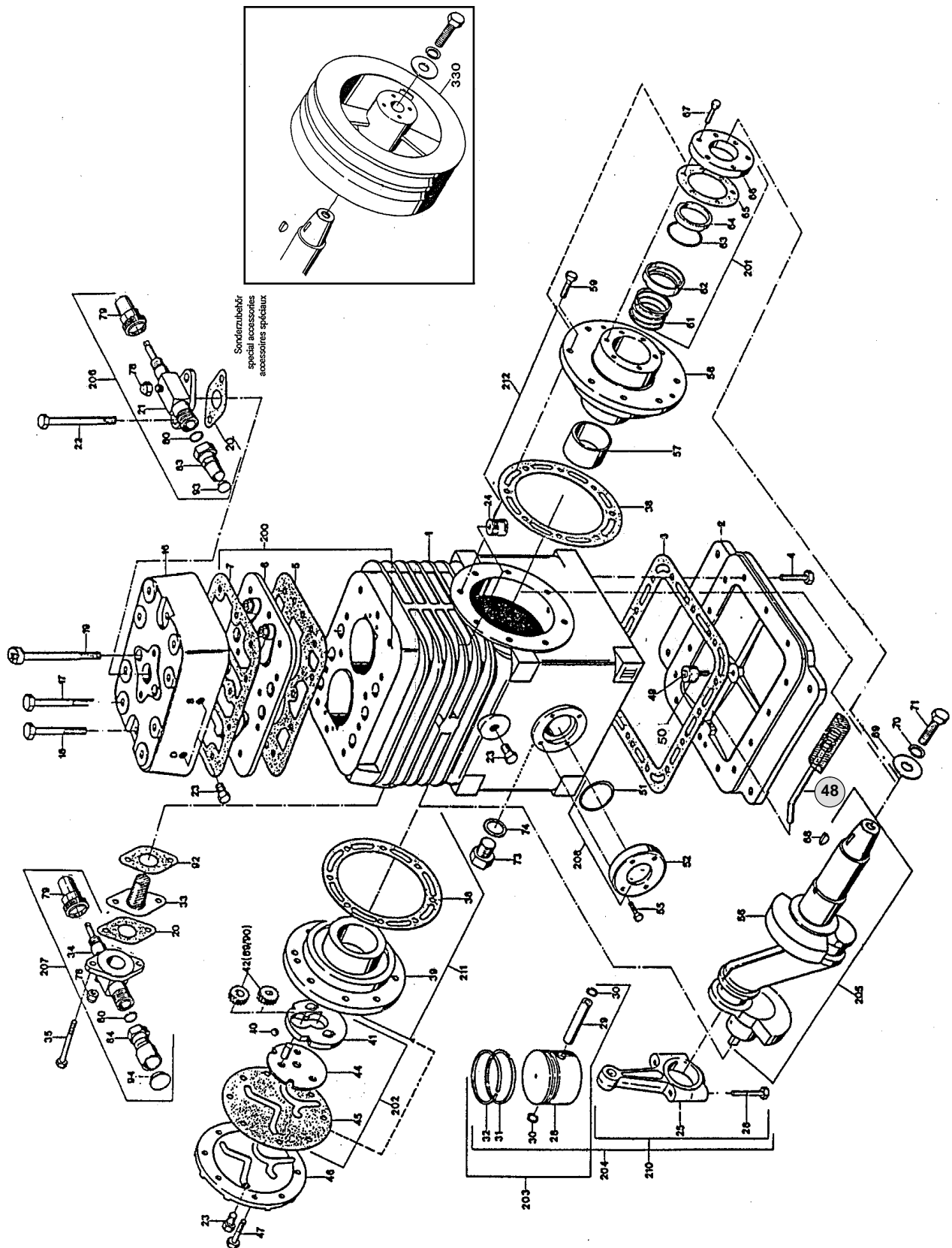
MAINTENANCE MANUAL OF THE POT TENDING MACHINE

79	Cap nut f. shut-off-valve	2		05809	
80	Gasket soldered con.shut	1		05807	
83	Soldered connection NW20	1		05803	
84	Soldered connection NW25	1		05804	
89	Gear wheel driving	1		05321	
90	Gear wheel driven	1		05325	
92	Valve flange gasket	1		05083	
93	Stud dia.22,5	1		05618	
94	Stud dia.28,8	1		05619	
95	Nameplate 35x61	1		05611	
198	Technical manual F1-F16	1		06256	

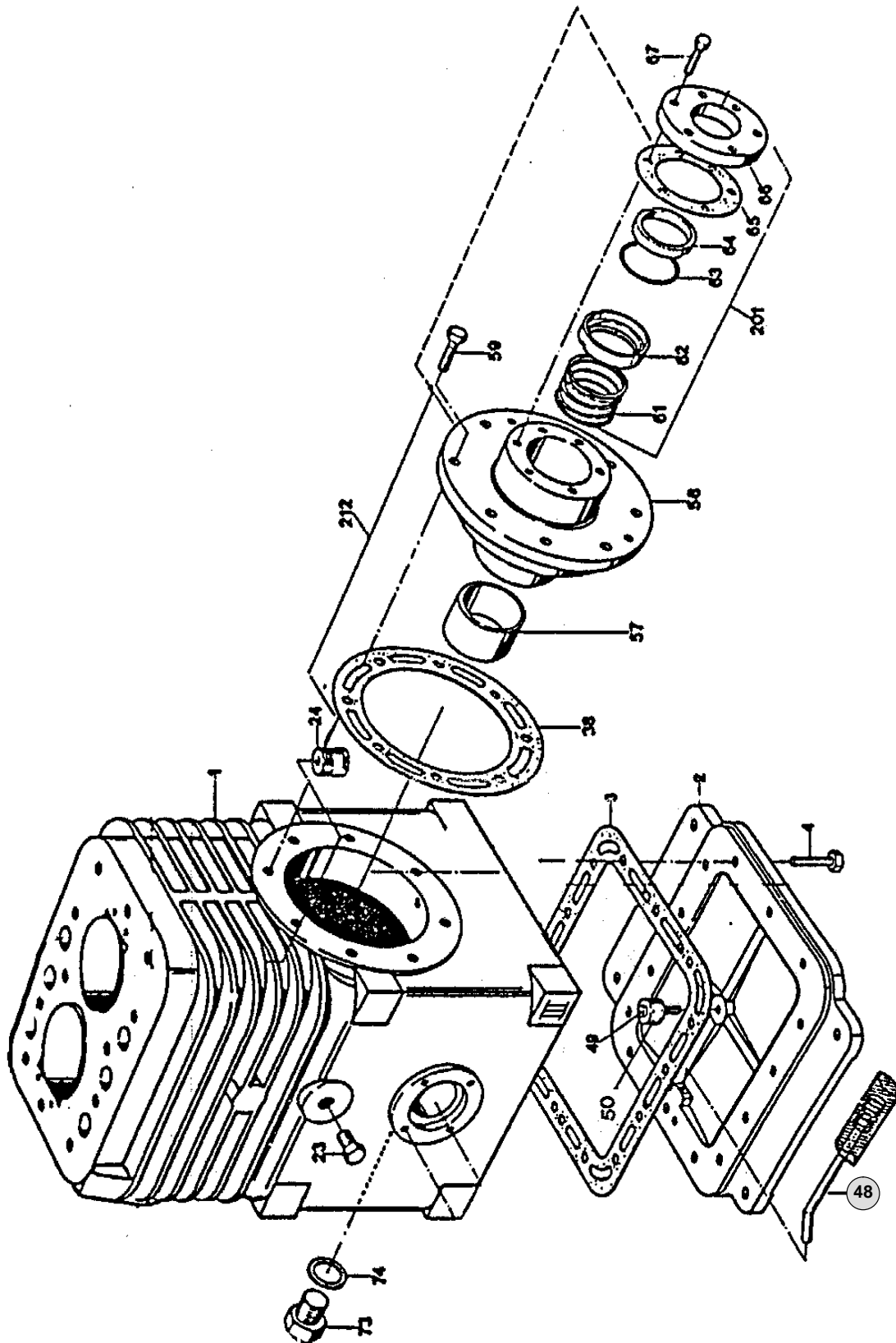
ASSY KITS					
200	Set valve plate / Consisting of items : 5-6-7			08198	0-03-357-45
201	Set shaft seal / Consisting of items : 61-62-63-64-65-66			08001	0-03-357-37
202	Set oil pump Consisting of items : 40-41-42-44-45			08043	
203	Set piston dia.55 Consisting of items : 28-29-30-31-32			80103	
204	Set piston, connecting rod Consisting of items : 25-26-28-29-30-31-32			08034 / 08022	
205	Set crankshaft Consisting of items : 56-68			08054	
206	Set shut-off valve NW20t Consisting of items : 20-21-78-79-80-83-93			08088	
207	Set shut-off valve NW25 / Consisting of items : 20-34-78-79-80-84-88-94			08091	
208	Set sight glass Consisting of items / : 51-52			08130	
209	Set gaskets Consisting of items / : 3-5-7-20-38-45-51-65-74-80-92			08070	0-03-357-38
210	Set connecting rod Consisting of items :25-26			08304	
211	Set bearing rear Consisting of items : 38-39-45			08155	
212	Set bearing front Consisting of items : 38-58-65			08153	

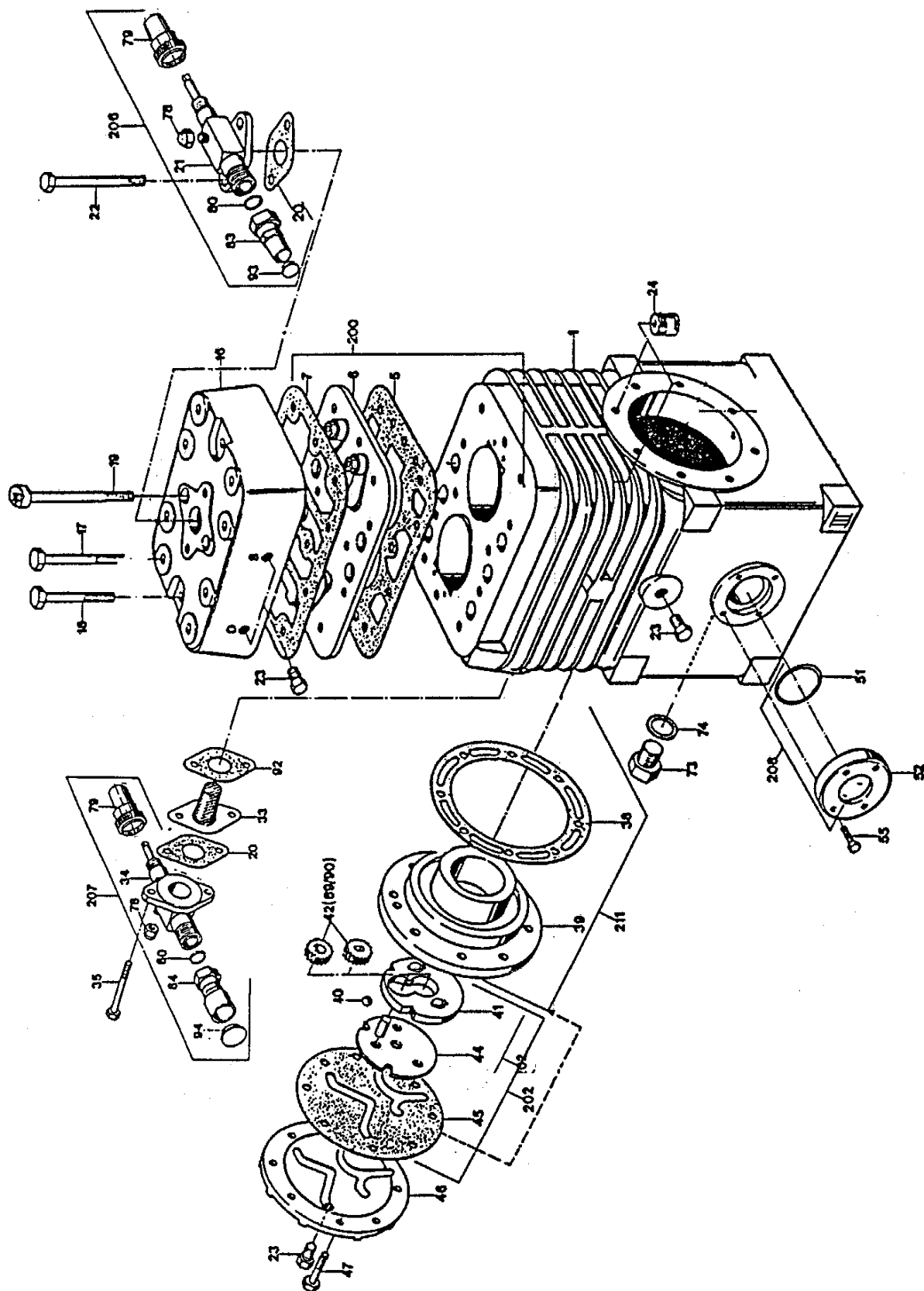
SPECIAL ACCESSORIES					
313	Set start unloader Special accessories 220-240V			08131	
314	Set W-cylinder cover Special accessories			08143	
315	Oil sump heater 60 W Special accessories 220-240V			08424	
330	Flywheel dia.210			04186	



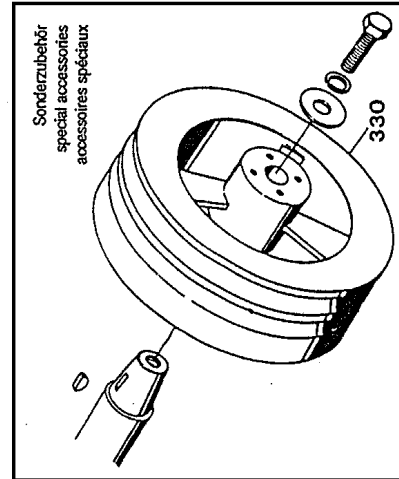


1. DETAIL VIEWS





MAINTENANCE MANUAL OF THE POT TENDING MACHINE



8.11 SPARE PARTS FOR COMPRESSOR F5 / FX5

LOCATION	DESIGNATION	ECL CODE (A/C UNIT)	COMPRESSOR	ECL CODE
Air conditioning units of the cab	FR75-15 MEV	1-10-484-04	BOCK FX5	1-10-315-45



MA'ADEN

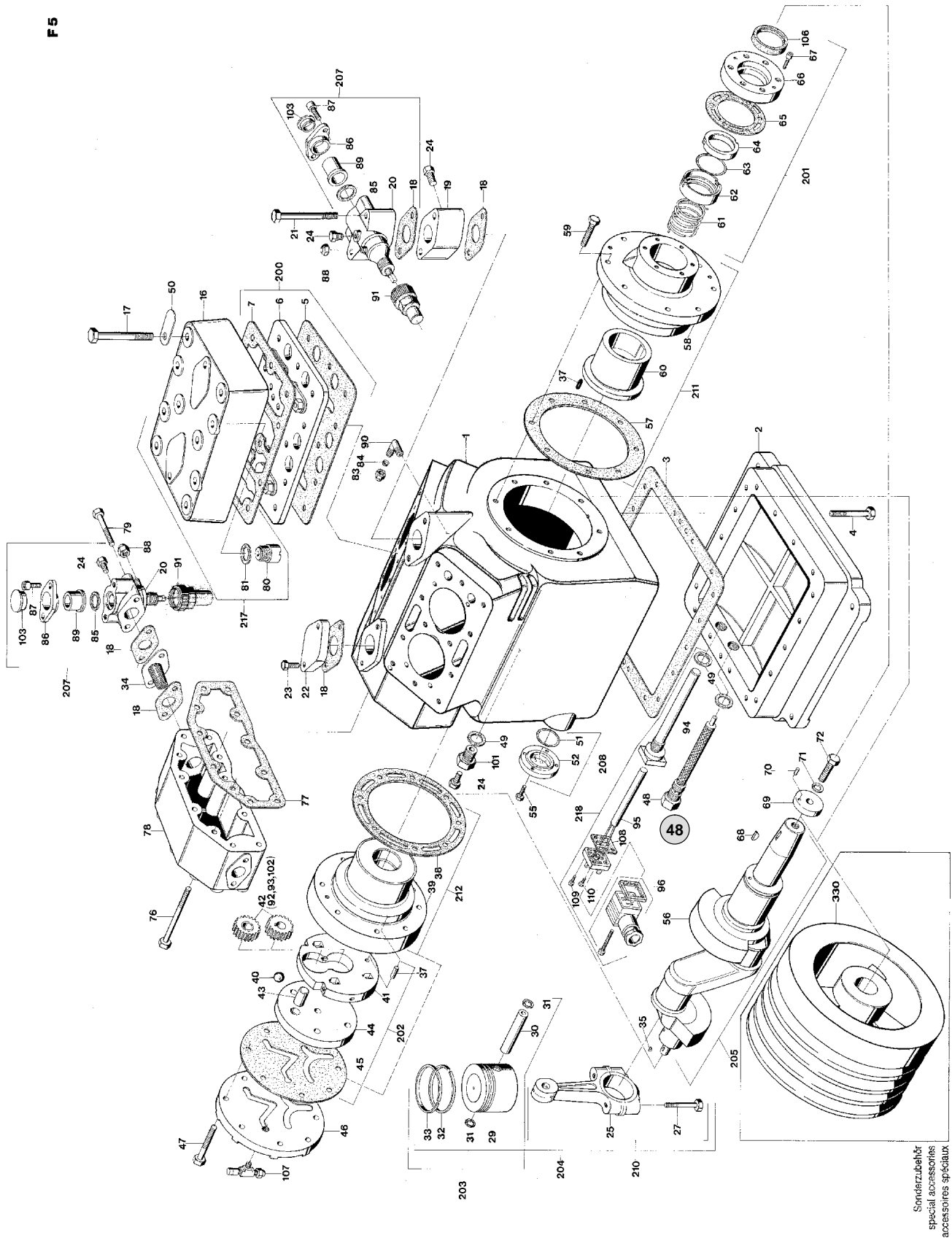
MAINTENANCE MANUAL OF THE POT TENDING MACHINE

SPARE PART LIST OF THE F5 COMPRESSOR

POSITION	CODE	DESCRIPTION	ONLY AVAIL. AS COM. AS. KIT / ITEM	Q T Y	NOTE
1	4015	COMPRESSOR CASING		1	
2	4037	BASE PLATE		1	
3	5047	BASE PLATE GASKET		1	
4	5431	HEX. HEAD SCREW M8X55		1	
5	5030	LOWER VALVE PLATE GASKET		2	
6	7593	VALVE PLATE COMPLETE	.. 200	2	
7	5012	UPPER VALVE PLATE GASKET		2	
16	4085	CYLINDER COVER	.. 217	2	
17	6828	HEXAGON HEAD SCREW M10X75		24	
18	5083	VALVE FLANGE GASKET		7	
19	4167	INTERMEDIATE FLANGE OVAL 46MM		1	
20	7128	SHUT-OFF VALVE LESS SOLD UNION		3	
21	5455	HEX. HEAD SCREW M10X110		2	
22	4269	BLANK FLANGE 15MM		1	
23	5846	HEX. HEAD SCREW M10X30		2	
24	5514	"LOCKING SCREW 1/8" NPTF"		5	
25	4484	CON.ROD 116,5 LONG (W.BEAR.)	.. 210	4	
26	5720	CLAMPING SLEEVE 10X20			
		NOT SHOWN IN EXPLODED VIEW	.. 210	8	
27	5234	CONNECTING ROD SCREW M8X45		8	
29	7141	PISTON DIA.70	.. 203	4	
30	7214	PISTON PIN DIA.20X13X60		4	
31	5569	SEEGER CIRCLIP 20X1		8	
32	5391	OIL CONTROL RING PISTON 70		4	
33	5381	TAPERED COMPR.RING PISTON 70		4	
34	3370	FILTER SUCTION SIDE		2	
35	5670	WOODRUFF KEY A3X3,7		1	
37	5688	GROOVED PIN 5X14		2	
38	5056	REAR BEARING FLANGE GASKET		1	
39	4125	REAR BEARING FLANGE		1	
40	5566	STEEL BALL DIA.9		4	
41	4381	PUMP-CASING		1	
42	5328	SET GEAR WHEEL OIL-PUMP		1	
43	5700	CYLINDER ROLLER 13X20		1	
44	4382	PUMP PLATE		1	
45	5077	COVER PLATE GASKET		1	
46	4164	COVER PLATE		1	
47	6624	HEX. HEAD SCREW M8X50		8	
48	4442	OIL FILTER, CPL.		1	
49	5342	SEAL RING 27X22X2		3	
51	5153	O-RING DIA.34,59X2,62		1	
52	6001	SIGHT GLASS	.. 208	1	
55	5402	HEX. HEAD SCREW M6X16		4	



F 5



Sonderzubehör
special accessories
accessoires spéciaux

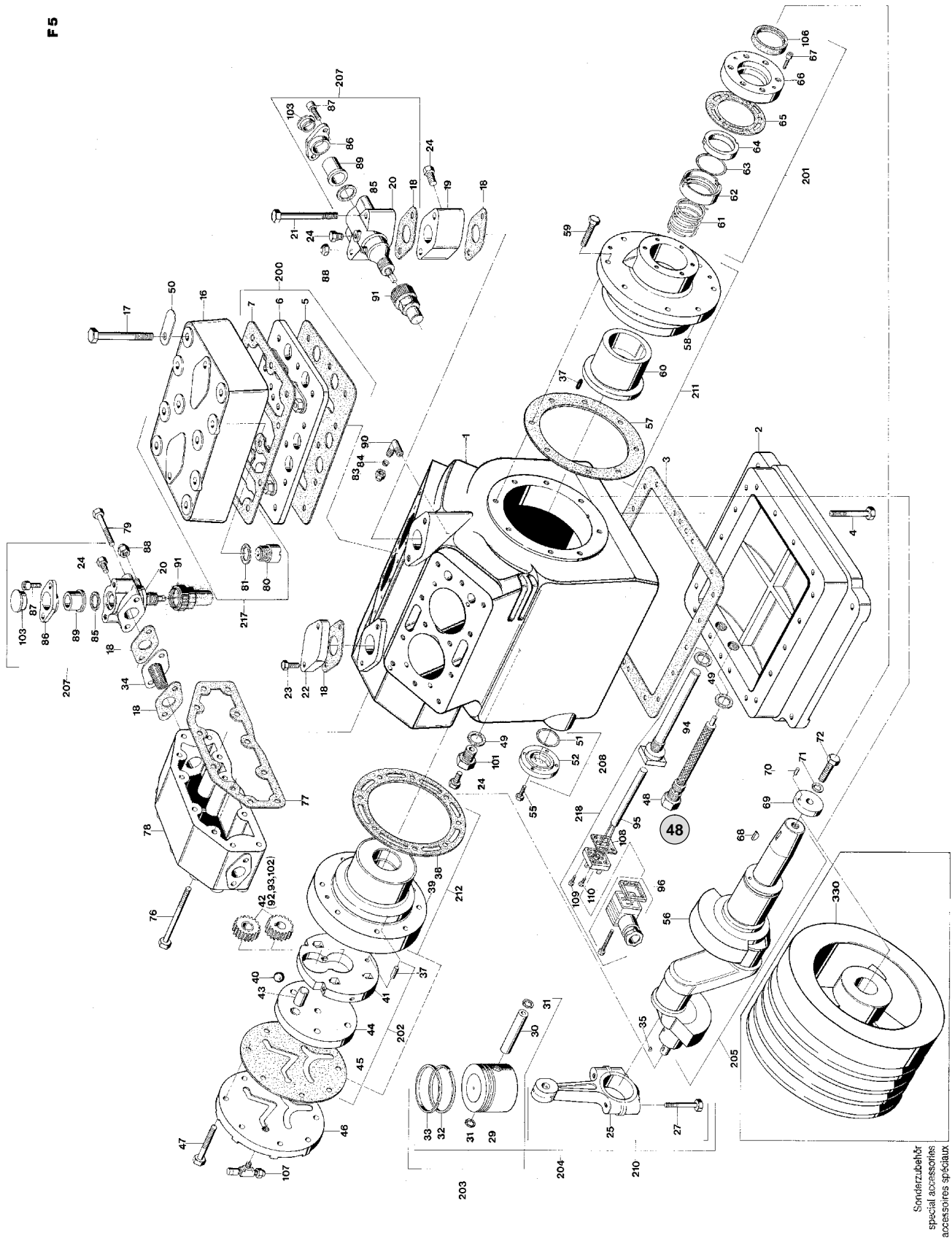
MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

SPARE PART LIST OF THE F5 COMPRESSOR

POSITION	CODE	DESCRIPTION	ONLY AVAIL. AS COM. AS. KIT / ITEM	Q T Y	NOTE
56	4495	CRANKSHAFT 55 STROKE	.. 205	1	
57	5049	FRONT BEARING FLANGE GASKET		1	
58	4143	FRONT BEARING FLANGE		1	
59	5846	HEX. HAED SCREW M10X30		8	
60	4359	FRONT BEARING		1	
61	6405	PRESSURE SPRING	.. 201	1	
62	6403	GUIDE RING F.SHAFT SEAL GASKET	.. 201	1	
63	5160	O-RING DIA.37,70X3,53	.. 201	1	
64	6401	RING SLIP	.. 201	1	
65	5063	SHAFT SEAL COVER GASKET		1	
66	4308	SHAFT SEAL COVER	.. 201	1	
67	6330	CYLINDER SCREW M8X20		6	
68	5673	WOODRUFF KEY A5X9		1	
69	4425	DISC DIA. 50X12,5X8		1	
70	5686	CLAMPING SLEEVE 4X8		1	
71	5666	SPRING WASHER B12		1	
72	5462	HEX. HEAD SCREW M12X40		1	
76	5437	HEX. HEAD SCREW M8X100		1	
77	5072	GASKET SUCTION SIDE		1	
78	4163	COVER SUCTION SIDE		1	
79	6034	HEX. HEAD SCREW M10X65		4	
80	7940	SAFETY VALVE F. 25BAR OPER.		2	
81	5791	SEAL RING 27,8X24,2X2		2	
83	5528	"UNION NUT 7/16"" UNF"		1	
84	5545	"SEALING CAP 7/16"" UNF"		1	
85	5067	GASKET SOLDERED CONNECT.		3	
86	4329	FLANGE OVAL 16MM		3	
87	5489	CYLINDER SCREW M10X35		6	
88	5789	"CAP NUT UNF 7/16""		3	
89	5313	BRAZED HEXAGON NIPPLE DM 35		3	
90	5541	SCREWED UNION DIN 8906		1	
91	5784	CAP NUT M22X1,5		3	
92	5329	GEAR WHEEL OIL-PUMP DRIVEN	.. 202	1	
93	5338	GEAR WHEEL OIL-PUMP DRIVEN	.. 202	1	
94	7572	HEATING ELEMENT HOUSING 60-80W	.. 218	1	
95	7565	HEATER INSERT 80W 220-240V	.. 218	1	
	7569	HEATER INSERT 80W SPEC.VOLTAGE	.. 218	1	
96	5972	CABLE BOX	.. 218	1	
101	5956	LOCKING SCREW M22X1,5		1	
102	5375	BEARING BUSH DIA.15XDIA.13X10	.. 202	1	
103	5620	PROTECTIVE PLUG DIA.35,5		3	
104	6256	NAMEPLATE,UNPRINTED 35x61 MM		1	
106	5841	RADIAL SHAFT SEAL RING		1	

F 5



Sonderzubehör
special accessories
accessoires spéciaux

MA'ADEN

MAINTENANCE MANUAL OF THE POT TENDING MACHINE

SPARE PART LIST OF THE F5 COMPRESSOR

POSITION	CODE	DESCRIPTION	ONLY AVAIL. AS COM. AS. KIT / ITEM	Q T Y	NOTE
107 ...	5752	TEE-PIECE W.SCHR.CONN.ONE		1	
108 ...	5971	GASKET F.PLUG BASE	.. 218	1	
109 ...	5958	CYLINDER SCREW M3X10	.. 218	2	
110 ...	5959	CYLINDER SCREW M3X4	.. 218	1	
124 ...	9983	"LABEL"" CONNECTION PLAN TO BE FIXED AT OIL SUMP HEATER NOT SHOWN"		1	
198 ...	9702	OPERATING INSTRUCTIONS F1-16 INDIVIDUALLY ADDED		1	

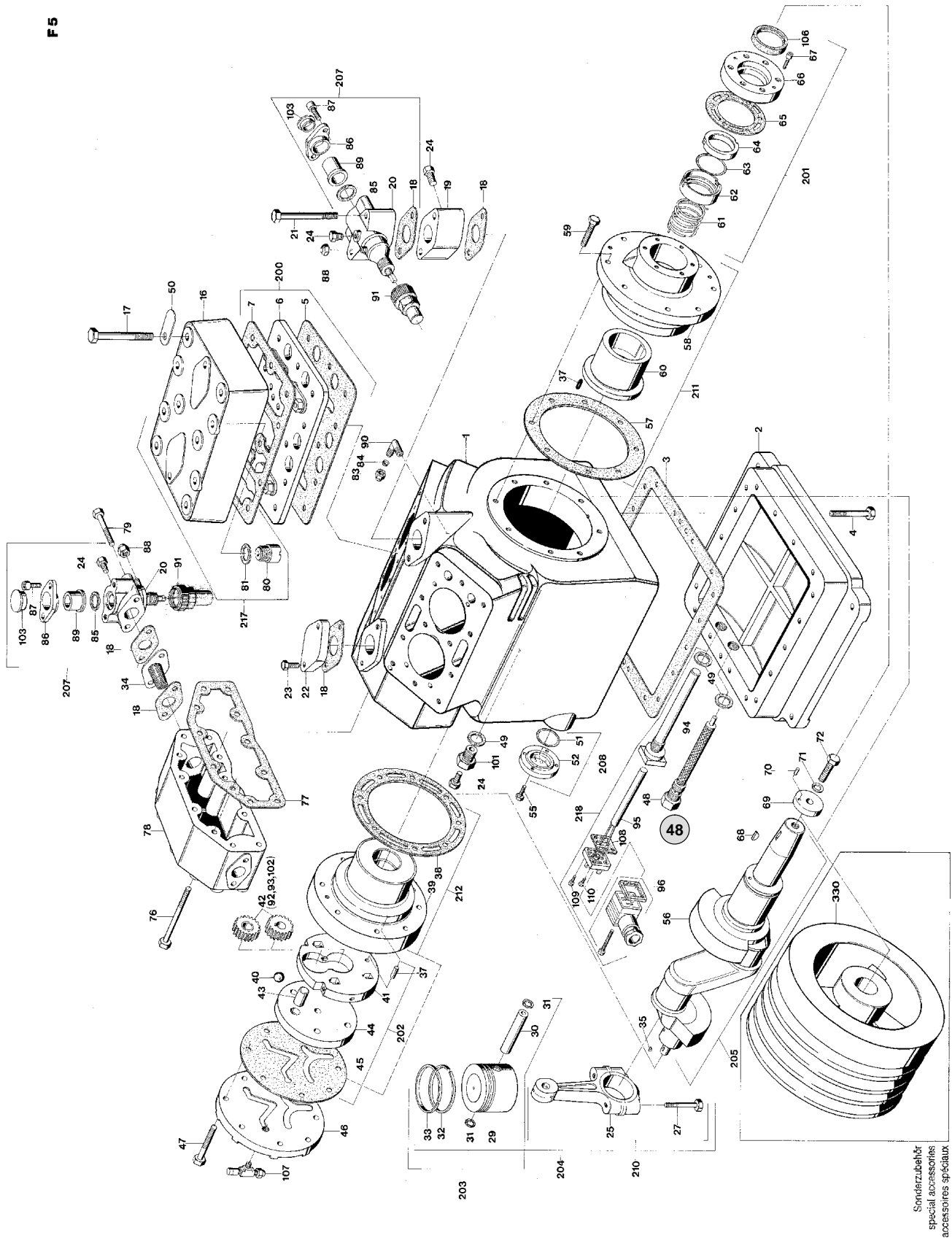
ASSEMBLY KITS

POSITION	CODE	DESCRIPTION	ONLY AVAIL. AS COM. AS. KIT / ITEM	Q T Y	NOTE
200 ...	8436	SET VALVE PLATE		2	
201 ...	8008	SET SHAFT SEAL		1	
0-03-357-25					
202 ...	8044	SET OIL PUMP		1	
203 ...	8035	SET PISTON DIA.70		4	
204 ...	8025	SET PISTON-CONN.ROD W.2 RINGS		4	
205 ...	8056	SET CRANKSHAFT		1	
207 ...	8082	SET SHUT-OFF VALVE NW32		3	
208 ...	8130	SET SIGHT GLASS		1	
209 ...	8072	SET GASKETS NOT SHOWN		1	
210 ...	8307	SET CONNECTING ROD		4	
211 ...	8164	SET FRONT BEARING		1	
212 ...	8157	SET REAR BEARING		1	
217 ...	8329	SET CYLINDER COVER		2	
218 ...	8425	SET OIL SUMP HEAT.80W 220-240V		1	
	8429	SET OILS.HEAT 80W 110-130V,SP.		1	
290 ...	8456	SET OIL FILTER NOT SHOWN		1	

SPECIAL ACCESORIES (NOT SHOWN)

POSITION	CODE	DESCRIPTION	ONLY AVAIL. AS COM. AS. KIT / ITEM	Q T Y	NOTE
313 ...	8141	SET START UNL.AL81-4/5 220-240		1	
314 ...	8565	SET CAP. REG. LR87 220-240V		1	
316 ...	8147	SET W-CYLINDER COVER F. LR		1	
330 ...	4189	FLYWHEEL DIA.230 SHOWN IN EXPLODED VIEW		1	

F 5



Sonderzubehör
special accessories
accessoires spéciaux

8.12 ELECTRONIC CONTROLLER IC 915 (CABIN)

LOCATION	DESIGNATION	ECL CODE (A/C UNIT)	COMPRESSOR	ECL CODE
Air conditioning units of the cab	IC 915		BOCK FX5	1-10-315-45

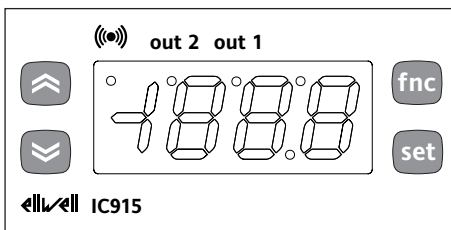


USER INTERFACE

The user has a display and four keys for controlling status and programming of the instrument.

KEYS AND MENUS

UP key		Scrolls through the menu items Increases the values
DOWN key		Scrolls through the menu items Decreases the values
fnc key		ESC function (exit)
set key		Accesses the setpoint Accesses the menus Confirms the commands



At start-up the instrument performs a Lamp Test; for few seconds the display and the leds blink, in order to verify their integrity and correct operation. The instrument has two main menus: the "Machine Status" and "Programming" menu.

ACCESSING AND USING MENUS

Resources are arranged in a menu, which can be accessed by pressing and quickly releasing the "set" key ("Machine Status" menu) or by holding down the "set" key for more than 5 seconds ("Programming" menu).

To access the contents of each folder, indicated by the relevant label, just press the "set" key once.

You can now scroll through the contents of each folder, modify it or use its functions. If you do not use the keyboard for over 15 seconds (time-out) or if you press the "fnc" key once, the last value shown on the display is confirmed and you return to the previous screen mask.

MACHINE STATUS MENU

(See Machine Status Menu Diagram)

To access the "Machine Status" menu Press and quickly release the "set" key. The label "SP1" appears.

By using the "UP" and "DOWN" keys you can scroll through the other folders in the menu:

-SP1: Setpoint 1 setting folder.

-SP2: Setpoint 2 setting folder.

Setpoint 1 (Setpoint 2) Setting

Access the "Machine Status" menu by pressing and quickly releasing the "set" key. The label of the "SP1" folder appears. (To set Setpoint 2 use the "UP" and "DOWN" keys until it is shown "SP2". To display the Setpoint 1 (2) value press the "set" key again.

The value appears on the display.

To change the Setpoint 1 (2) value, use the "UP" and "DOWN" keys within 15 seconds.

If the parameter is LOC = y the Setpoint cannot be changed.

PROGRAMMING MENU

(See Programming Menu Diagram)

To enter the "Programming" menu, press the "set" key for more than 5 seconds.

If specified, the access PASSWORD will be requested, (parameter "PA1"), and the label of the first folder will follow.

To scroll through the other folders, use the "UP" and "DOWN" keys;

To enter the folder, press "set". The label of the first visible parameter appears. To scroll through the other parameters, use the "UP" and "DOWN" keys; to change the parameter, press and release "set", then set the desired value using the "UP" and "DOWN" keys, and confirm with the "set"

key to move to the next parameter.

PLEASE NOTE: It is strongly recommended to switch off and switch on again the controller anytime parameters have been changed to prevent malfunctioning on configuration and/or ongoing timings.

PASSWORD

The password "PA1" allows access to level 1 parameters. In the standard configuration passwords is not present.

To enable it (value 0) and assign the desired value, access the "Programming" menu, within the folder with the "diS" label. If passwords is enabled, you will see it at the entrance of the "Programming" menu.

COPY CARD

The Copy Card is an accessory connected to the TTL serial port which allows programming quickly the instrument parameters (upload and download parameter's map). The operation is performed as follows:

Format

This command allows copy card formatting, an operation necessary in case of first use or to copy maps with different models.

Warning: if the copy card has been programmed, using the "Fr" the data entered are erased. This operation cannot be cancelled.

Upload

This operation loads the programming parameters from the instrument.

Download

This operation downloads to the instrument the programming parameters.

The operations are performed accessing the folder identified by the "FPr" label and selecting, according to the case, "UL", "dL" or "Fr" commands; the operation is confirmed by pressing the "set" key. If the operation is successful an "y" is displayed, on the contrary, if it fails a "n" will be displayed.

NOTE:

- **UPLOAD:** instrument --> Copy Card
- **DOWNLOAD:** Copy Card --> instrument.

Download "from reset (instrument OFF"

Connect the copy card with the instrument OFF (not under voltage).

When the instrument is switched on the programming parameters will be downloaded into the instrument; after the lamp-test the display will show for about 5 seconds:

LED

Position	Related Function	Status
OUT1	relay 1 (OUT1)	ON when the regulator is started up; blinking in case of delay, protection or blocked enabling
OUT2	relay 2 (OUT2)	ON when the regulator is started up; blinking in case of delay, protection or blocked enabling
	Alarm	ON when the alarm is enabled; blinking when the alarm is silenced

- label dLY if copy operation successful
- label DLn if not

PLEASE NOTE:

- after the download operation the instrument will immediately work with the new parameters map setting

KEYBOARD LOCKING

The instrument includes a facility for disabling the keyboard, by programming the "LOC" parameter (see folder with "diS" label). If the keyboard is locked, you can still access the programming menu by pressing the "set" key. The Setpoint can also be viewed.

DIAGNOSTICS

The alarm condition is always signalled by the buzzer (if present) and by the led of the alarm icon (🔊)

The alarm signal produced by a faulty regulator probe (referred to probe 1)

Error table

DISPLAY	ERROR
E1	regulator probe fault

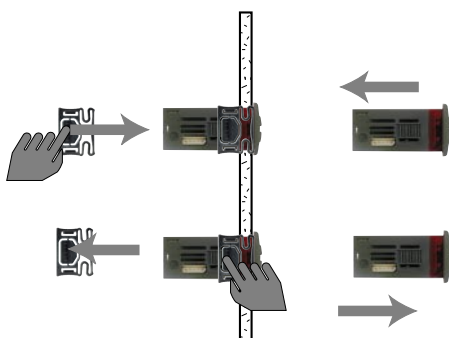
is shown as E1 on the instrument display. When the sensor detects an error condition:

- the code E1 is displayed
- the regulator is activated as indicated by the "On1 (On2)" and "OF1 (OF2)" parameters if programmed for the duty cycle or:

On1 (On2)	OF1 (OF2)	regulator output
0	0	OFF
0	>0	OFF
>0	0	ON
>0	>0	dc

INSTALLATION

The instrument is designed for panel mounting. Make a hole of 29x71 mm, insert the instrument and fix it using the brackets provided. Do not mount the instrument in humid and/or dirty places; it is suitable for use in ordinary polluted places. Ventilate the place in proximity to the instrument cooling slits.



ELECTRICAL WIRING

Attention! Never work on electrical connections when the machine is switched on.

The instrument is equipped with screw terminal boards for connection of electrical cables with a diameter of 2.5 mm² (one conductor only per terminal for power connections).

For the capacity of the terminals, see the label on the instrument.

The relay contacts are voltage free. Do not exceed the maximum current allowed; in case of higher loads, use an appropriate contactor. Make sure the power supply voltage complies with the one required by the instrument.

In 12V versions the power supply must be provided by a security transformer with the protection of a delayed 250 mA fuse. Probes have no connection polarity and can be extended using a regular bipolar cable (note that the extension of the probes affects the EMC electromagnetic compatibility of the instrument: pay extreme attention to wiring). Probe cables, power supply cables and the TTL serial cables should be distant from power cables.

CONDITIONS OF USE

PERMITTED USE

For safety reasons the instrument must be installed and used according to the instruction provided and in particular, under normal conditions, parts bearing dangerous voltage levels must not be accessible.

The device must be adequately protected from water and dust as per the application and must also only be accessible via the use of tools (with the exception of the frontlet).

The device is ideally suited for use on household appliances and/or similar refrigeration equipment and has been tested with regard to the aspects concerning European reference standards on safety. It is classified as follows:

- according to its manufacture: as an automatic electronic control device to be incorporated by independent mounting;
- according to its automatic operating features: as a 1 B-type operated control type;
- as a Class A device in relation to the category and structure of the software

UNPERMITTED USE

Any other use other than that permitted is de facto prohibited. It should be noted that the relay contacts provided are of a practical type and therefore subject to fault. Any protection devices required by product standards or dictated by common sense due to obvious safety reasons should be applied externally.

LIABILITY AND RESIDUAL RISKS

Invensys Controls Italy S.r.L. shall not be liable for any damages deriving from:

- installation/use other than that prescribed and, in particular, that which does not comply with safety standards anticipated by regulations and/or those given herein;
- use on boards which do not guarantee adequate protection against electric shock, water or dust under the conditions of assembly applied;
- use on boards which allow access to dangerous parts without the use of tools;
- tampering with and/or alteration of the products;

TECHNICAL DATA

Frontal panel protection: IP65.

Casing: plastic body in resin type PC+ABS UL94 V-0, inspection window in polycarbonate, buttons in thermoplastic resin.

Dimensions: frontal panel 74x32 mm, depth 59 mm (without wirings).

Installation: on panel, with drilling template 71x29 mm (+0.2/-0.1 mm).

Use temperature: -5...55 °C.

Storage temperature: -30...85 °C.

Use environment humidity: 10...90 % RH (not condensing).

Storage environment humidity: 10...90% RH (not condensing).

Viewing range:

- NTC: -50...110°C (-58...230°F);

- PTC: -50...140°C (-58...302°F)

without decimal point (selectable through parameter on 3 digit & 1/2 + mark display.

Serial: TTL for connection to Copy Card.

Analog input: one PTC or NTC input (programmable by parameter).

Digital outputs: 1 SPDT output on 8(3)A 1/2 hp, 1 SPST output on 8(3)A 1/2 hp configurables. (for relay capabilities see label on the instrument)

Measuring range: from -50 to 140 °C.

Accuracy: 0.5% better than end scale + 1 digit.

Resolution: 0,1°C (0,1°F within +199,9°F, 1°F over).

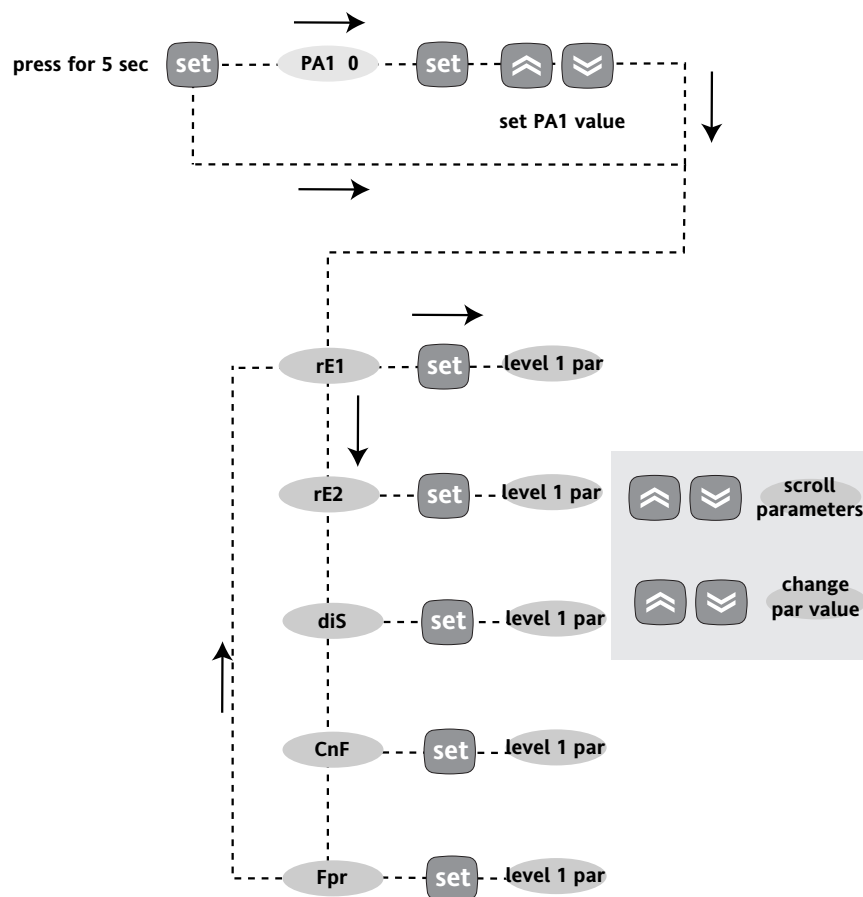
Consumption

- model 230V: 3 VA max.

- model 12V: 1,5 VA max.

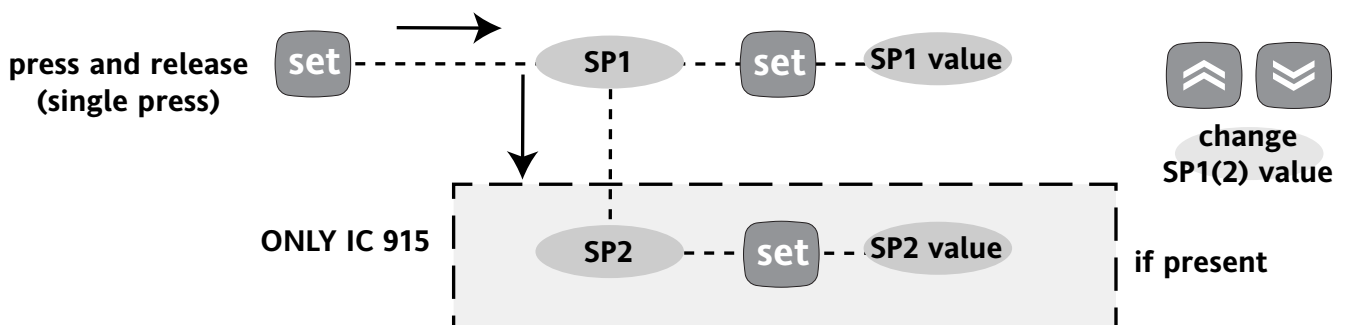
Power supply: 12 V~/~ ±10% or 230V~ ±10% 50/60 Hz.

Warning: check the power supply specified on the instrument label; for relay and power supply capacities, contact the Sales Office).



Programming Menu Diagram

level 1



Status Machine Diagram

PLEASE NOTE: The technical data included in this document, related to measurement (range, accuracy, resolution, etc.) refer to the instrument itself, and not to its equipment such as, for example, sensors. This means, for example, that sensor(s) error(s) shall be added to the instrument's one.

DISCLAIMER

This manual and its contents remain the sole property of Invensys Controls Italy s.r.l., and shall not be reproduced or distributed without authorization. Although great care has been exercised in the preparation of this document, Invensys Controls Italy s.r.l., its employees or its vendors, cannot accept any liability whatsoever connected with its use. Invensys Controls Italy s.r.l. reserves the right to make any changes or improvements without prior notice.

Tab. 1 Parameter Table

PARAMETER	DESCRIPTION	RANGE	DEFAULT*	VALUE*	U.M.
HC1	REGULATOR 1 (folder with “rE1” label) Heat/Cool Mode. If set to H the generic regulator actuates for hot operation. If set to C the generic regulator actuates for cold operation.	H/C	H/C*		flag
db1	Intervention 1 band see ON-OFF regulation diagram	0...30.0	1*		°C/°F
dF1	diFFerential. Relay 1 tripping differential. The regulator stops on reaching the Setpoint value (as indicated by the adjustment probe), and restarts at temperature value equal to the Setpoint 1 plus (o minus depending on HC1) the value of the differential. see ON-OFF regulation diagram	0.0...30.0	0 (n.z. models)* 1*		°C/°F
HS1	Higher SEt. Maximum possible setpoint 1 value.	LS1...HdL	140*		°C/°F
LS1	Lower SEt. Minimum possible setpoint 1 value.	LdL...HS1	-50*		°C/°F
dn1	REGULATOR 1 PROTECTIVE DEVICE (folder with “rE1” label) Delay time in activating the regulator relay after switch-on of instrument.	0...250	1		°C/°F
do1	Delay after switch off. The indicated time must elapse between switch-off of the regulator relay and the successive switch-on.	0...250	0		sec
di1	Delay between switch-ons. The indicated time must elapse between two successive switch-ons of the regulator.	0...250	0		min
dE1	Delay before switch-off. The indicated time must elapse between switch-off request and the switch-off of the regulator.	0...250	0		min
On1	On time (regulator 1). Regulator activation time in the event of faulty probe. If set to “1” with OF1 at “0” the regulator is always on, while at OF1 >0 it functions always in duty cycle mode.	0...250	0		sec
OF1	OFF time (regulator 1). Regulator in disabled state time in the event of a faulty probe. If set to “1” with On1 at “0” the regulator is always off, while at On1 >0 it functions always in duty cycle mode.	0...250	1		min
HC2	REGULATOR 2 (folder with “rE2” label) Heat/Cool Mode. If set to H the generic regulator actuates for hot operation. If set to C the generic regulator actuates for cold operation.	H/C	H/C*		min
db2	Intervention 2 band see ON-OFF regulation diagram	0...30.0	1*		flag
dF2	diFFerential. Relay 1 tripping differential. The regulator stops on reaching the Setpoint value (as indicated by the adjustment probe), and restarts at temperature value equal to the Setpoint 1 plus (o minus depending on HC1) the value of the differential. see ON-OFF regulation diagram	0.0...30.0	0 (n.z.models)* 1*		°C/°F
HS2	Higher SEt. Maximum possible setpoint 2 value.	LS1...HdL	140*		°C/°F
LS2	Lower SEt. Minimum possible setpoint 2 value.	LdL...HS1	-50*		°C/°F
dn2	REGULATOR 2 PROTECTIVE DEVICE (folder with “rE2” label) Delay time in activating the regulator relay after switch-on of instrument.	0...250	1		sec
do2	Delay after switch off. The indicated time must elapse between switch-off of the regulator relay and the successive switch-on.	0...250	0		min
di2	Delay between switch-ons. The indicated time must elapse between two successive switch-ons of the regulator.	0...250	0		min
dE2	Delay before switch-off. The indicated time must elapse between switch-off request and the switch-off of the regulator.	0...250	0		sec
On2	On time (regulator 2). Regulator activation time in the event of faulty probe. If set to “1” with OF1 at “0” the compressor is always on, while at OF2 >0 it functions always in duty cycle mode.	0...250	0		min
OF2	OFF time (regulator 2). Regulator in disabled state time in the event of a faulty probe. If set to “1” with On2 at “0” the regulator is always off, while at On2 >0 it functions always in duty cycle mode.	0...250	1		min
LOC	DISPLAY (folder with “diS” label) (keyboard) LOCK (set and keys). Keyboard locking. However, you can enter parameter programming modify them along with the status of this parameter in order to allow keyboard locking. y = yes; n = no	n/y	n		flag
PA1	PAssword 1. When enabled (value other than 0) it constitutes the access key for level 1 parameters.	0...250	0		num
ndt	number display type. View with decimal point. y = yes; n = no	n/y	n		flag
CA1	CAlibration 1. Calibration 1. Positive or negative temperature value added to the value read by probe 1.	-30.0...30.0	0		°C/°F
dro	display read-out. Select °C or °F for displaying the temperature read by the probe.	°C/°F	°C		flag
H00 (1) (!)	CONFIGURATION (folder with “CnF” label) Probe type selection, PTC or NTC.	PtC/ntC	PtC/ntC*		flag
H01	Outputs link 0 = independents; 1 = related; 2 = Neutral Zone;	0/1/2	0/1/2*		flag
H10	delay time in activating the outputs after switch-on WARNING! If set = 0 it is not active; if set 0 output will not be activated before this time	0...250	0		min
rEL	reLease firmware. Device version: read only parameter.	/	/		/
tAb	tAble of parameters. Reserved: read only parameter.	/	/		/
UL	COPY CARD (folder with “Fpr” label) Up load. Programming parameter transfer from instrument to Copy Card.	/	/		/
dL	Down load. Programming parameter transfer from Copy Card to instrument	/	/		/
Fr	Format. Erasing all data in the copy card. PLEASE NOTE using “Fr” parameter (copy card formatting) the data within the copy card will be lost permanently. The operation cannot be cancelled. After using the copy Card device the controller must be switch off and switch on again	/	/		/

(1) check the probe type NTC/PTC installed (see the label on the instrument).

* DEFAULT column: for parameters HC1/2, HS1/2, LS1/2, DF1/2, H00/01/10 the default depends on the model.

* VALUE column: to be filled manually, with customized settings (if different from the default value).

(!) WARNING!

- If one or more of these parameters highlighted with (!) are modified, the controller must be switched off and switched on again to ensure correct operation.
- It is strongly recommended, anyway to switch off and switch on again the controller anytime parameters have been changed to prevent malfunctioning on configuration and/or ongoing timings

ON-OFF Regulation Diagram

ON-OFF regulation diagram independent.
The outputs regulate as they as completely independent

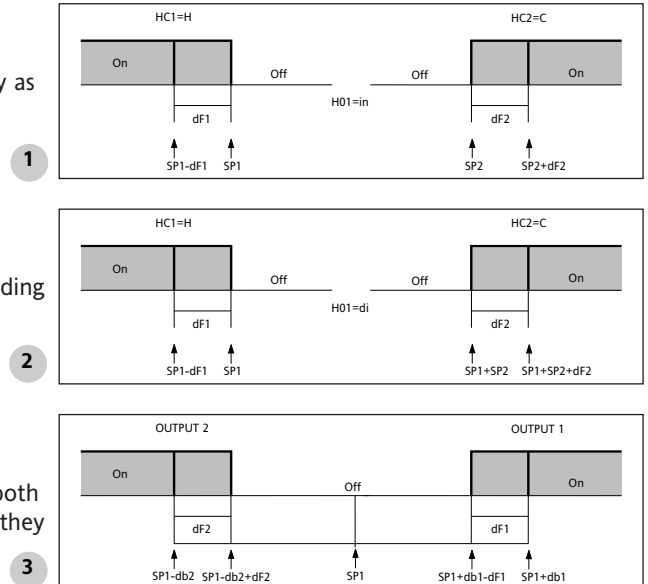
HC1	HC2	H01	regulation type
H	C	0	independents setpoints
H	C	1	related setpoints
-	-	2	Neutral Zone

PLEASE NOTE:

- for 1 & 2 examples with HC1=H and HC2=C
- for 3 HC1 and HC2 are ignored

ON-OFF regulation diagram related.
Setpoint 2 SP2 works depending on Setpoint SP1

ON-OFF regulation diagram Neutral Zone.
NOTE: if dF1 and dF2 are both =0 outputs will open when they reach SP1 value



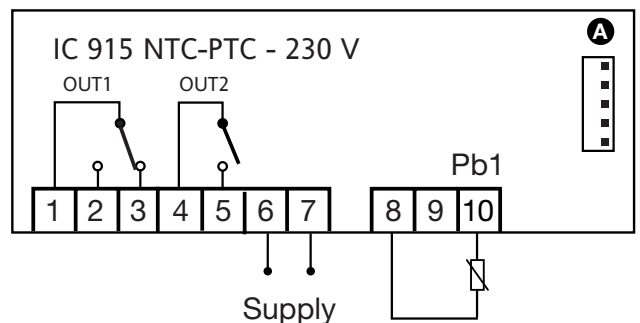
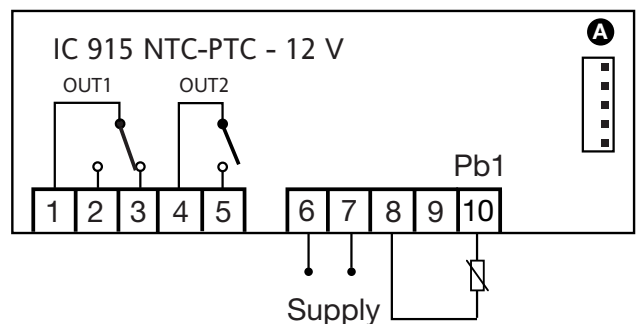
Wiring diagram

WIRING (12V and 230V supply)

1 - 2	N.C. regulator 1 relay output (OUT1)
1 - 3	N.O. regulator 1 relay output (OUT1)
4 - 5	N.O. regulator 2 relay output (OUT2)
6 - 7	Power supply 1,5 VA max. (12V version) Power supply 3 VA max. (230V version)
8 - 10	Probe 1 input (regulator) Pb1
A	TTL input for Copy Card

PLEASE NOTE:

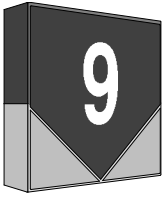
- User Default Settings
- for relay capacities check on the instrument label
In the diagram there are shown only 12V and 230V supply and relays with 8(3) 1/2 hp 250V capability



Invensys Controls Italy s.r.l
via dell'Industria, 15 Zona Industriale Paludi
32010 Pieve d'Alpago (BL) ITALY
Telephone +39 0437 986111
Facsimile +39 0437 989066
Internet <http://www.climate-eu.invensys.com>

5/2003 eng
cod. 9IS22086

IC 915 NTC/PTC



LIFTING UNITS

CONTENTS OF THE CHAPTER

DESCRIPTION OF LIFTING UNITS	9.1-1
OPERATING AND MAINTENANCE INSTRUCTIONS FOR LIFTING UNITS	9.2-1
CABLES CERTIFICATES	9.3-1



9.1 DESCRIPTION OF LIFTING UNITS

1. HOIST UNITS DESCRIPTION

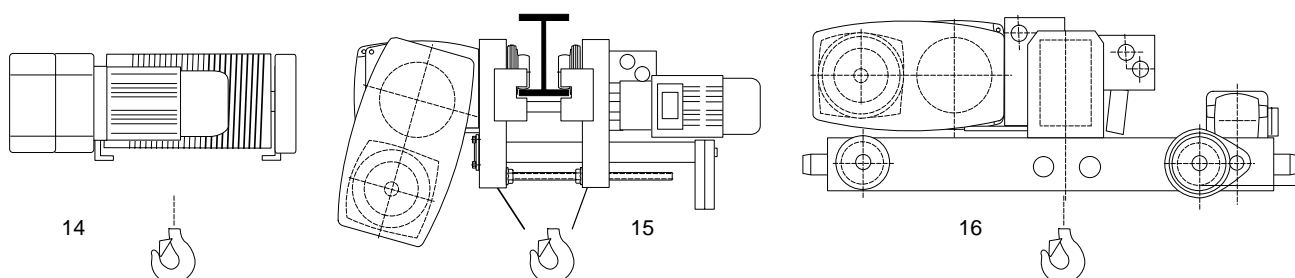
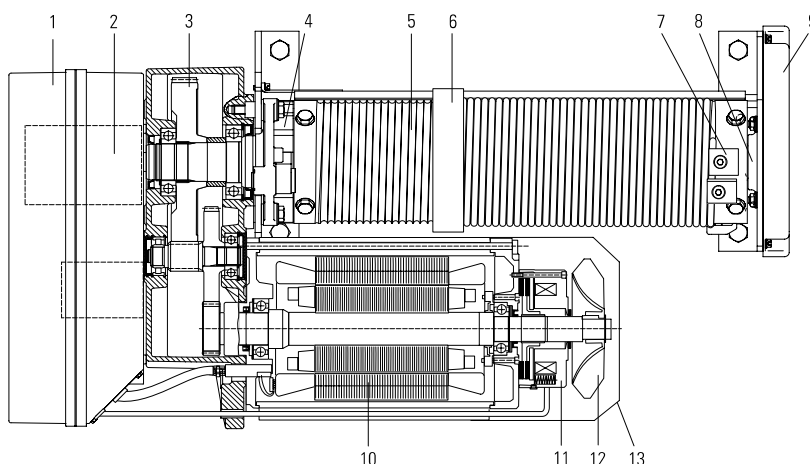
- Reference ————— **TYPE F DR-PRO 5-5**
- Fonction ————— Equipé 5T pullet ass'y
- ECL code ————— 1-10-515-06
- Load capacity ————— 5 000 kg
- FEM classification ——— M5
- Lifting speed ————— 0,96 / 5,4 m/mn
- Lifting height ————— 10 m

2. DELIVERY CONDITIONS

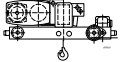


- The lifting cables are winded on the liftings drums.
- The pulley block and attachment for cable are separatly delivered.
- The lifting and cross travel reducers are lubricated.




3. DESCRIPTION




- 1 — Panel box with connecting parts
- 2 — Gear-type limit switch
- 3 — Gear
- 4 — Mounting point for safety brake
- 5 — Rope drum
- 6 — Rope guide with rope tensioner
- 7 — Clamps for rope tensioner
- 8 — Rope drum bearing
- 9 — End cover
- 10 — Motor
- 11 — Brake
- 12 — Fan
- 13 — Fan cover
- 14 — Stationary hoist
- 15 — Wire rope hoist with monorail trolley
- 16 — Wire rope hoist with double rail crab



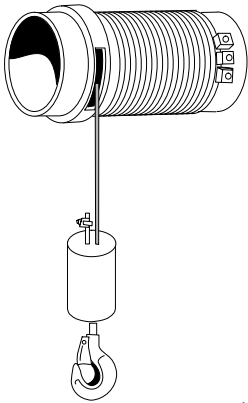
4. STAHL REEVINGS

		
	SH 3 - SH 5	SH 6
		
2/1	4	4
4/1	5	5
4/2-1	8	8

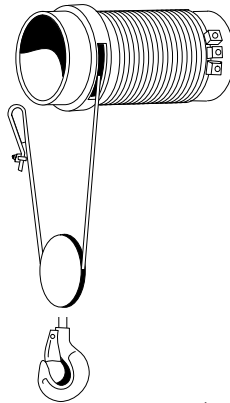
		
	SH 3 - SH 5	SH . 6
		
2/1	4	4
4/1	5	5
2/2-1	8	8

		
	SH 3 - SH 5	SH 6
		
1/1	1	1
2/1	2	4
4/1	3	5
2/2-1	6	6
4/2-1	7	8

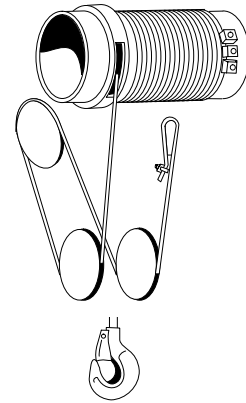
1) L



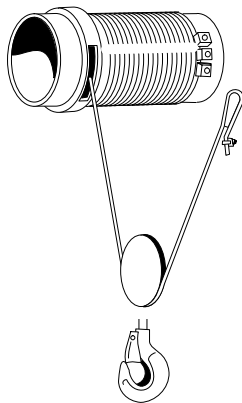
2) L



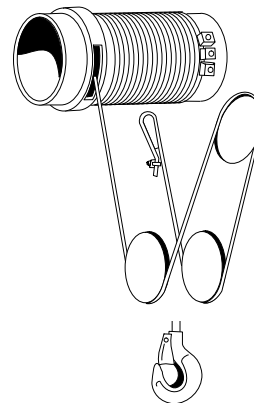
3) L



4) L



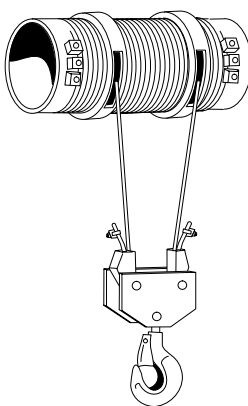
5) L



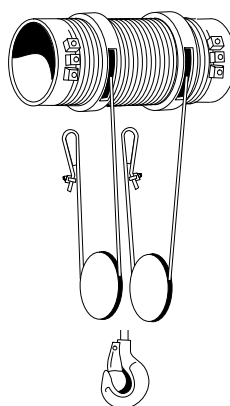
R = Right-hand thread

L = Left-hand thread

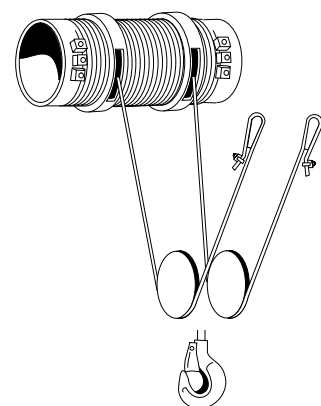
6) R L



7) R L

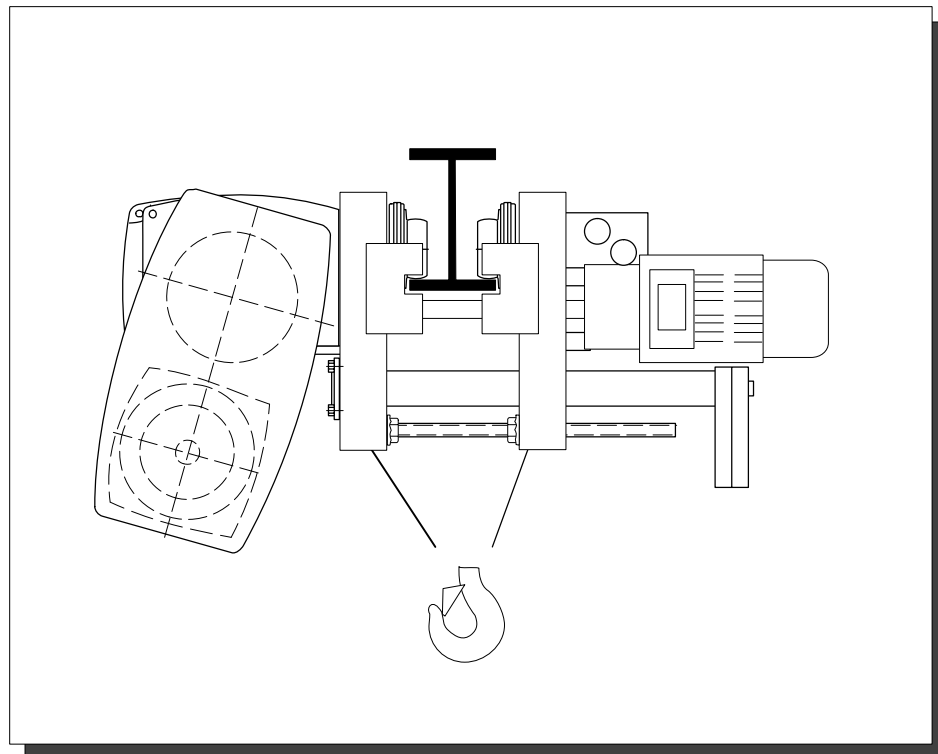


8) R L



**9.2 OPERATING AND MAINTENANCE INSTRUCTIONS
FOR LIFTING UNITS**

LOCATION	E.C.L. CODE	REFERENCE	LIFTING MOTOR REF.	LIFTING BRAKE REF.	LOAD CAPACITY
Equiped 5T pullet ass'y	1-10-515-06	TYPE F DR-PRO 5-5	ZBR 100 D12/2 R	B050	5 000 kg





Seilzüge
Wire rope hoists
Palans à câble
Polipastos de cable
Diferenciais de cabo
Paranchi a fune
Staaldraadtakels



Betriebs- und Instandhaltungsanleitung
Operating and maintenance instructions
Notice d'utilisation et d'entretien
Instrucciones de servicio y de mantenimiento
Manual de instruções e da manutenção
Manuale di istruzioni e della manutenzione
Gebruiks- en onderhoudsaanwijzing



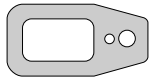
Inhaltsverzeichnis	Contents	Table des matières
Sicherheitshinweise	Safety instructions	Consignes de sécurité
Symbole	Symbols	Symboles
Bestimmungsgemäße Verwendung	Use for intended purpose	Utilisation conforme à la destination
Sicherheitsbewusstes Arbeiten	Safety-conscious operation	Travailler avec le souci de la sécurité
Organisatorische Maßnahmen zur Sicherheit	Organisational safety precautions	Mesures d'organisation en vue de la sécurité
Allgemeine Vorschriften	General regulations	Consignes générales
Montage, Inbetriebnahme, Wartung und Reparatur	Installation, commissioning, maintenance and repair	Montage, mise en service, entretien et réparations
Garantie	Guarantee	Garantie
Wiederkehrende Prüfung	Periodic tests	Contrôle périodique
Kundendienst	After sales service	Service après vente
Seilzug kennenlernen	Getting to know the wire rope hoist	Faire connaissance avec le palan
Seilzug montieren	Installing wire rope hoist	Montage du palan
Stationären Seilzug	Stationary wire rope hoist	Palan à poste fixe
Unergürtelfahrwerk	Monorail trolley	Chariot sur membre inférieur
Zweischienenfahrwerk	Double-rail crab	Chariot biral
Fahrendsschalter	Travel limit switches	Interrupteurs de fin de course de direction
Elektrische Einrichtungen	Electrical equipment	Équipement électrique
Netzanschluss	Mains connection	Branchement sur le secteur
Seilenscheren	Reeving rope	Mouflage du câble
Seilzug in Betrieb nehmen	Commissioning wire rope hoist	Mise en service du palan
Inbetriebnahme	Commissioning	Mise en service
Seilzug bedienen	Operating wire rope hoist	Maintenance du palan
Pflichten des Kranführers	Duties of crane operator	Obligations de l'opérateur
Seilzug prüfen und warten	Inspecting and servicing wire rope hoist	Contrôle et entretien du palan
Prüftabelle	Inspection table	Tableau de contrôle
Wartungstabelle	Maintenance table	Tableau d'entretien
Hubwerksbremse	Hoist brake	Frein du palan
Fahrwerksbremse	Trolley brake	Frein du chariot
Hubendschalter	Hoist limit switch	Interrupteur d'urgence en fin de course de levage
Überlastabschaltung	Overload cut-off	Système d'arrêt automatique en cas de surcharge
Seiltrieb	Rope drive	Mouflage
Laufrollen, Lauftrahnen und Laufbahn	Wheels, wheel drive and runway	Roues, entraînement des roues, et chemin de roulement
Restrukturierungsdauer	Remaining service life	Durée restante d'utilisation
Generalüberholung	General overhaul	Révision générale
Fehlersuche	Fault-finding	Recherche des pannes
Was tun wenn?	What should be done if?	Que faire si
Technische Daten	Technical data	Caractéristiques techniques
Stromlaufpläne	Circuit diagrams	Schémas des connexions
Verschleißteile	Wearing parts	Pièces d'usure
Konformitätserklärung	Certificate of conformity	Déclaration de conformité
Änderungen vorbehalten	Subject to alterations	Sous réserve de modifications

Sicherheitshinweise

Safety instructions

Consignes de sécurité

Transport



Der Seilzug wird mit einer Spezialpalette ausgeliefert. Damit ist es möglich, den Seilzug mit einem Gabelstapler sicher zu verladen und entladen.
Wird der Seilzug hängend transportiert, ist er an den vorhandenen **Aufhängelaschen**, ↑ Skizze, anzuschlagen.

Transport

The wire rope hoist is delivered on a special pallet. This enables the hoist to be loaded and unloaded safely with a fork-lift truck.
If the wire rope hoist is to be transported suspended, it must be attached by the **suspension lugs** provided, ↑ sketch.

Symbole

Arbeitssicherheit

Dieses Symbol steht bei allen Hinweisen zur Arbeitssicherheit, bei denen Leib und Leben von Personen gefährdet ist.



Warnung vor elektrischer Spannung

Abdeckungen wie Hauben und Deckel, die mit diesem Zeichen gekennzeichnet sind, dürfen nur von "Fachkräften oder unterwiesenen Personen" geöffnet werden.



Warnung vor schwebender Last

Jeglicher Aufenthalt von Personen unter schwebender Last ist nicht zulässig. Es besteht Gefahr für Leib und Leben!



Betriebsicherheit

Dieses Symbol steht bei allen Hinweisen, bei denen Nichtbeachtung Schäden am Seilzug oder am transportierten Gut entstehen können.



Safety in operation

Information marked with this symbol must be observed to avoid damage to the wire rope hoist or the goods transported.

Diese Symbole markieren in dieser Betriebsanleitung besonders wichtige Hinweise auf Gefahren und Betriebssicherheit.

In these operating instructions, these symbols mark particularly important information on risks and safety in operation.

Transport

Le palan à câble est livré avec une palette spéciale qui permet de le charger et de le décharger en toute sécurité avec un chariot élévateur.
Si le palan est transporté par grue, il faut le suspendre par les **pattes d'élingage** existantes, ↑ croquis.

Symboles

Sécurité du travail

Ce symbole se trouve partout où figurent des remarques relatives à la sécurité du travail, là où il y a menace pour la vie et l'intégrité corporelle de personnes.

Mise en garde contre la tension électrique

Recouvrements tels que capots et couvercles pourvus de ce signe ne doivent être ouverts que par des "hommes de métier ou des personnes ayant été initiées".

Mise en garde contre charge en suspension

Tout séjour de personnes sous une charge en suspension est interdit. Il y a menace pour la vie et l'intégrité corporelle !

Sécurité de fonctionnement

Ce symbole accompagne toutes les consignes dont la non-observation peut avoir pour conséquence des détériorations du palan ou du produit transporté.

Dans la présente notice d'utilisation, ces symboles attirent l'attention sur des remarques particulièrement importantes visant des dangers et la sécurité de fonctionnement.

Sicherheitshinweise

Safety instructions

Consignes de sécurité

Bestimmungsgemäße Verwendung

Seilzüge sind zum Heben von frei beweglichen und geführten Lasten bestimmt, die sich nicht verformen können. Sie werden je nach Bauart stationär oder verfahrbar eingesetzt. Wenn Lasten horizontal gezogen werden sollen, bei geführten Lasten, bei Automatikbetrieb, bei lang andauernder Totlast oder immer gleichen Hubbewegungen ist dies im Einzelfall prüfen zu lassen. Im Zweifelsfall fragen Sie bitte den Hersteller.
• Keine Änderungen und Umbauten vornehmen. Zusätzliche Anbauten bedürfen der Genehmigung durch den Hersteller



Nicht erlaubt sind:

- Überschreiten der zulässigen Höchstlast
- Befördern von Personen
- Schräges Anziehen von Lasten
- Losreißen von Lasten
- Ziehen oder Schleppen von Lasten, wenn der Seilzug dafür nicht besonders ausgelegt ist
- Manipulationen an der Überlastabschaltung
- Schlafselbstbetrieb
- Ist das Hebezeug "Teil einer Maschine" hat der Verkehrrbringer sicherzustellen, dass das Hebezeug den speziellen Vorschriften des Einsatzfalles entspricht.

Sicherheitsbewusstes Arbeiten

Das Heben von Lasten größer als der Nennlast ist verboten. Auch bei vorhandener Überlastabschaltung können durch unsachgemäßen oder nicht bestimmungsgemäßen Gebrauch Gefahren entstehen:
• Vor dem ersten Arbeiten mit dem Seilzug die Betriebsanleitung lesen.
• Die "Pflichten des Kranführers" beachten, ↑ 54.
• Immer sicherheitsbewusst und gefahrfrei arbeiten.
• Vor dem Arbeiten sich kundig machen, wo die NOTHALTE-Einrichtung ist (In der Regel im Steuerschalter).
• Notendbegrenzung (Notend-



Use for intended purpose

- Wire rope hoists are intended solely for lifting freely movable loads which cannot tilt. Depending on their design, they are for stationary or mobile use. If loads are to be towed horizontally, in the case of guided loads, automatic operation, prolonged deadweight or repeated identical hoist motions, the individual application must be examined. Please contact the manufacturer in case of doubt.
- Do not carry out any alterations or modifications. Additional fittings must be authorised by the manufacturer.

Not allowed:

- Exceeding the safe working load
- Transporting persons
- Pulling loads at an angle
- Tearing loads loose
- Pulling or towing loads if the wire rope hoist has not been especially selected for this application
- Manipulating the overload cut-off
- Slack rope
- If the hoist forms "part of a machine", the person placing it on the market must ensure that the hoist meets the specific regulations of the application.

Safety-conscious operation

It is forbidden to lift loads greater than the nominal load. In spite of the presence of an overload cut-off, dangers may arise due to incorrect use or use for an unintended purpose.
• Read the operating instructions before starting to work with the wire rope hoist.
• Observe the "Duties of crane operator", ↑ 54.
• Always work in a safety-conscious manner and avoid risks.
• Before starting work, find out where the EMERGENCY STOP facility is (usually in the control pendant).
• Do not use the emergency limit switch (final limit switch for highest and lowest hook position) as an

Utilisation conforme à la destination

- Les palans sont destinés à lever des charges libres en déplacement et assujetties à un guidage, qui ne peuvent pas se concevoir. Suivant le type, ils sont utilisés à poste fixe ou libres en translation. Si des charges doivent être tirées horizontalement ou sont guidées, en service automatique, dans le cas d'une charge morte prolongée ou de mouvements de levage répétés, il faut faire examiner chaque cas particulier. Adressez-vous au fabricant en cas de doute.
- Ne faire ni modifications ni transformations. L'adjonction d'éléments complémentaires doit être autorisée par le fabricant

Il n'est pas permis de :

- Dépasser la charge max. admise,
- Transporter des personnes,
- Procéder à la traction oblique de charges,
- Arracher des charges,
- Tirer ou traîner des charges si le palan n'est pas spécialement conçu à cet effet,
- Manipuler le système d'arrêt automatique en cas de surcharge
- Faire fonctionner l'appareil avec brin mou
- Si le palan est une « partie d'une machine », le responsable de la mise en circulation doit garantir que le palan est conforme aux prescriptions particulières du cas d'utilisation.

Travailler avec le souci de la sécurité

Il est interdit de soulever des charges dépassant la charge nominale. Malgré l'existence d'un système d'arrêt automatique en cas de surcharge, des dangers peuvent résulter d'une utilisation de façon impropre ou pour un usage ne répondant pas à la destination.
• Avant les premiers travaux avec le palan, lire la notice d'utilisation.
• Observer les "obligations de l'opérateur" ↑ 54.
• Toujours travailler avec le souci de la sécurité et à l'abri du danger.
• Avant le travail, se renseigner sur l'emplacement du dispositif d'ARRÊT D'URGENCE (en général dans le combiné).- En fonctionnement normal, ne pas



- schalter für höchste und tiefste Hakenstellung) nicht betriebsmäßig anfahren.
- Sämtliche Schäden und Mängel (abnormale Geräusche, beeinträchtigte Bremsfunktion, Deformationen, ...) am Seilzug sofort dem Verantwortlichen melden.
- Seilzug bis zur Behebung der Mängel nicht benutzen.
- Hinweisschilder am Seilzug nicht entfernen. Unleserliche oder beschädigte Schilder erneuern.
- Vor Inbetriebnahme von der zuständigen Stelle/Behörde abnehmen lassen.

- operational limit switch.
- Report all damage and defects to the wire rope hoist (abnormal noises, impaired braking function, deformations, ...) to the person responsible immediately. Do not use the wire rope hoist until the damage has been repaired.
- Do not remove information plates from the wire rope hoist. Replace illegible or damaged plates.
- Have the hoist tested by the appropriate institution before commissioning.

- accoster la limitation d'urgence en fin de course (interrupteurs d'urgence de fin de course pour les positions la plus élevée et la plus basse du crochet).
- Signaler immédiatement au responsable l'existence de toute détérioration et de détectusité du palan (bruits anormaux, fonction du train préjudiciée, déformations, ...).
- Ne pas utiliser le palan tant qu'il n'a pas été remédié aux détectusités.
- Ne pas enlever les plaques de mise en garde se trouvant sur le palan. Si des plaques sont illisibles ou détériorées, les remplacer.
- Avant la mise en service, demander à l'organe/l'autorité compétents de procéder à une réception.

Organisatorische Maßnahmen zur Sicherheit

- Nur geschulte oder unterwiesene Personen mit der Bedienung beauftragen. Gesetzliches Mindestalter beachten!
- In regelmäßigen Abständen überprüfen, ob sicherheitsbewusst gearbeitet wird.
- Vorgeschriebene Fristen für die wiederkehrende Prüfung einhalten. Prüfprotokolle im Prüfbuch aufbewahren.
- Betriebsanleitung am Einsatzort des Seilzuges griffbereit aufbewahren.

Organisational safety precautions

- Only direct persons to operate the hoist if they have been trained or instructed in its use. Observe the legal minimum age!
- At regular intervals, check that work is being carried out in a safety-conscious manner.
- Observe the intervals specified for periodic tests. File the test reports in the test log book.
- Store the operating instructions within easy reach where the wire rope hoist is operated.

Mesures d'organisation en vue de la sécurité

- Ne confier le maniement du palan qu'à du personnel ayant subi la formation voulue ou ayant été initié. Observer l'âge légal minimal !
- A intervalles réguliers, vérifier si le personnel travaille avec le souci de la sécurité.
- Observer les délais prescrits pour le contrôle périodique. Conserver dans le livret de contrôle le procès-verbal de contrôle.
- Garder la notice d'utilisation à portée de la main, au lieu d'utilisation du palan.



Allgemeine Vorschriften

- Sicherheits- und Unfallverhütungsvorschriften.
- Länderspezifische Vorschriften.
- Vorschriften, die in der EG-Konformitätserklärung aufgeführt sind.

General regulations

- Safety regulations and accident prevention regulations.
- National regulations.
- Regulations listed in the EC declaration of conformity.

Consignes générales

- Consignes générales de sécurité et de prévention des accidents.
- Consignes régionales.
- Consignes figurant dans la déclaration de conformité de la CE.

Montage, Inbetriebnahme, Wartung und Reparatur

- Die Montage, Inbetriebnahme, Wartung und Reparatur dürfen nur von Fachpersonal ausgeführt werden.
- Wir empfehlen, dass die Montage durch vom Hersteller beauftragte Monteure durchgeführt wird.
- Keine Änderungen und Umbauten vornehmen.
- Zusätzliche Anbauten bedürfen der Genehmigung durch den Hersteller.
- Wartung und Reparatur sind durch vom Hersteller beauftragte Monteure durchzuführen, ansonsten erlischt die Gewährleistung.
- Für die Reparatur ausschließlich Original-Ersatzteile verwenden, ansonsten erlischt die Gewährleistung.

Installation, commissioning, maintenance and repairs

- Erection, commissioning, maintenance and repairs may only be carried out by skilled personnel.
- We recommend having erection carried out by fitters engaged by the manufacturer.
- Do not carry out any alterations or modifications.
- Additional fittings must be authorised by the manufacturer.
- Maintenance and repairs must be carried out by fitters engaged by the manufacturer, otherwise the guarantee will expire.
- Use only **original spare parts** for repairs, otherwise the guarantee will expire.

Montage, mise en service, entretien et réparations

- Montage, mise en service, entretien et réparations ne doivent être exécutés que par du personnel spécialisé.
- Nous recommandons que le montage soit exécuté par des monteurs délégués par le fabricant.
- Ne pas faire de modifications ni de transformations.
- L'adjonction d'éléments complémentaires doit être autorisée par le fabricant.
- L'entretien et les réparations doivent être exécutés par des monteurs délégués par le fabricant, sinon la garantie ne joue plus.
- Lors de réparations, utiliser exclusivement des **pièces de rechange d'origine**, sinon la garantie ne joue plus.



Das Hebezeug ist konzipiert für übliche industrielle Umgebungsbedingungen. Für spezielle Einsatzfälle wie z.B. hohe chemische Belastung, Off-Shore etc., sind Sondermaßnahmen vorzusehen. Wir beraten Sie gerne.

The hoist is designed for normal industrial ambient conditions. For off-standard applications such as e.g. high degree of chemical pollution, offshore use etc., special measures must be taken. We will be pleased to advise you.

Le palan a été conçu pour des conditions ambiantes habituelles dans l'industrie. Des mesures spéciales sont à prévoir pour les cas d'utilisation particuliers, p.ex. forte sollicitation par des agents chimiques, off shore etc. Nous vous conseillons volontiers.

Arbeit der Seilzug ständig im Freien und ist der Witterung ungeschützt ausgesetzt, empfehlen wir ein kleines Dach anzubringen oder den Seilzug wenigstens unter einem Dach zu "parken".

If the wire rope hoist is constantly operated outside and exposed to the elements, we recommend fitting a small roof or at least "parking" the wire rope hoist under a roof.

Si le palan fonctionne continuellement à l'extérieur et est exposé aux intempéries, nous recommandons de le pourvoir d'un petit toit, ou tout au moins de le "garer" sous un toit.

Garantie

- Die Garantie erlischt, wenn die Montage, Bedienung, Prüfung und Wartung nicht nach dieser Betriebsanleitung erfolgt.

Guarantee

- The guarantee expires if these operating instructions are not observed for installation, operation, testing and maintenance.

Garantie

- La garantie ne joue pas si le montage, le maniement, le contrôle et l'entretien n'ont pas lieu conformément à la présente notice d'utilisation.

Wiederkehrende Prüfung

Hubwerke und Krane sind mindestens einmal im Jahr durch **Fachpersonal*** nach länder-spezifischer Vorschrift unter Umständen früher, zu prüfen. Das Prüfergebnis ist zu protokollieren und im Prüfbuch aufzubewahren. (Siehe Seite 56 ff.)

Bei dieser Prüfung muss auch die Restlebensdauer des Hubwerkes nach FEM 9.755 ermittelt werden. (Siehe Seite 98 ff.)

Alle Prüfungen sind vom Betreiber zu veranlassen.

Periodic tests

Hoists and cranes must be tested by **skilled personnel*** at least once a year, possibly earlier if so prescribed by national regulations. The results of the test must be recorded and filed in the test log book (see page 56 ff.).

The remaining service life of the hoist acc. to FEM 9.755 is also established during this test. (see page 98 ff.)

All tests must be initiated by the operator.

Contrôle périodique

Palans et ponts roulants doivent être contrôlés au moins une fois par an, le cas échéant plus tôt selon les consignes régionales, par du **personnel qualifié**. Le résultat du contrôle doit être consigné dans un procès-verbal et dans le livret de contrôle. (Voir page 56 ff.)

Lors de ce contrôle est déterminée aussi la durée restante de vie du palan selon FEM 9.755. Voir page 98 ff.

C'est au responsable de l'exploitation de faire exécuter tous ces contrôles.

Kundendienst

Sie haben sich mit dem Kauf dieses Seilzuges für ein hochwertiges Hubwerk entschieden. Unser Kundendienst berät Sie hinsichtlich eines fach- und sachgerechten Einsatzes.

Für die Erhaltung der Sicherheit und stetigen Verfügbarkeit Ihres Seilzuges empfehlen wir Ihnen den Abschluss eines Wartungsvertrages, in dessen Rahmen wir auch die "wiederkehrende Prüfung" für Sie übernehmen.

Reparaturen werden von unserem geschulten Fachpersonal schnell und preiswert ausgeführt.

After sales service

With the purchase of this wire rope hoist, you have decided on a high-quality piece of lifting equipment. Our after sales service will give you advice on its correct use.

In order to preserve the safety and constant availability of your wire rope hoist, we recommend concluding a maintenance contract according to which we undertake the "recurrent tests" for you.

Repairs will be carried out quickly and economically by our trained personnel.

Service après vente

Avec l'achat de ce palan, vous vous êtes décidé pour un dispositif de levage de haute qualité. Notre service après vente vous conseillera en vue d'une mise en œuvre correcte sur le plan de la technique et de la pratique professionnelle.

Pour le maintien de la sécurité et de la disponibilité permanente de votre palan, nous vous recommandons de conclure un contrat d'entretien dans le cadre duquel nous procédons pour vous aussi aux "contrôles périodiques".

Les réparations sont effectuées rapidement et à un prix intéressant, par notre personnel spécialisé, ayant reçu la formation voulue.

* siehe Seite 10 und 54

* see page 10 and 54

* voir page 10 et 54



Das modulare Konzept unserer Seilzugbaureihe ermöglicht eine Vielzahl von Varianten auf der Grundlage von Serienbaugruppen.

Gleichbleibend hohe Qualität gewährleistet unser zertifiziertes Qualitätssicherungssystem nach DIN ISO 9001/ EN 29001.

Bei offenen Fragen, z. B. bei kundenspezifisch modifizierten Hebezeugen, wenden Sie sich bitte an eine unserer Niederlassungen und Tochtergesellschaften. Wir beraten Sie gerne!

The modular concept of our series of wire rope hoists enables a multitude of variations on the basis of series components.

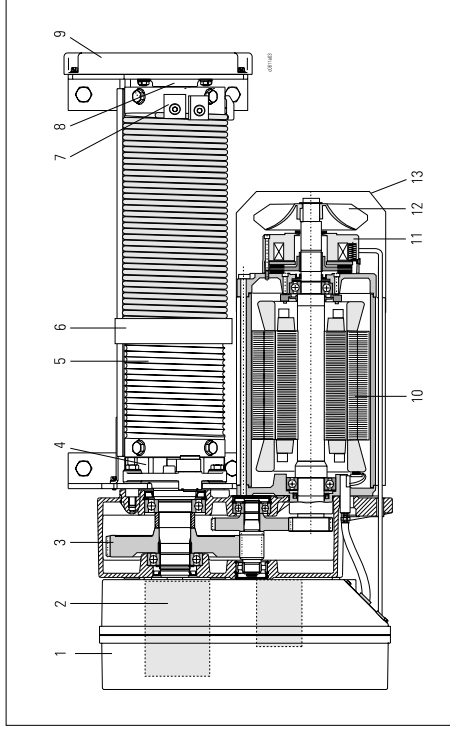
Our certified quality assurance system to DIN ISO 9001/EN 29001 guarantees consistently high quality.

If you have any questions, for example regarding hoists modified for customers' individual applications, please approach one of our branches or subsidiaries. We will be pleased to advise you!

La conception modulaire de notre série de palans permet une multitude de variantes sur la base de sous-ensembles de série.

Une qualité de haut niveau constant est garantie par notre système d'assurance qualité certifiée selon DIN ISO 9001/EN 29001.

Si vous avez des questions, p. ex. sur des palans modifiés spécifiquement pour un client, veuillez vous adresser à l'une de nos succursales ou filiales. C'est volontiers que nous vous conseillerons !



- | | | |
|--|---|---|
| 1 Steuerungskasten mit Anschlussteilen | 1 Panel box with connecting parts | 1 Coffret de commande avec pièces d'assemblage |
| 2 Getriebeendschalter | 2 Gear-type limit switch | 2 Sélecteur de fin de course |
| 3 Getriebe | 3 Gear | 3 Réducteur |
| 4 Anbaustelle für Sicherheitsbremse (SH3 - SH5) | 4 Mounting point for safety brake (SH3 - SH5) | 4 Emplacement de montage du frein de sécurité (SH3 - SH5) |
| 5 Seiltrommel | 5 Rope drum | 5 Tambour à câble |
| 6 Seilführungsring mit Seilspannfeder | 6 Rope guide with rope tensioner | 6 Bague guide-câble avec ressort de tension du câble |
| 7 Keilmen für Seilbefestigung | 7 Clamps for rope anchorage | 7 Pincettes de fixation du câble |
| 8 Seiltrommellagerung | 8 Rope drum bearing | 8 Paliers du tambour à câble |
| 9 Abschlusshaube | 9 End cover | 9 Capotage d'extrémité |
| 10 Motor | 10 Motor | 10 Moteur |
| 11 Bremse | 11 Brake | 11 Frein |
| 12 Lüfter | 12 Fan | 12 Ventilateur |
| 13 Lüfterhaube | 13 Fan cover | 13 Capotage de ventilateur |
| 14 Stationärer Seilzug, Einbauzug | 14 Stationary hoist, hoist for installation | 14 Palan à poste fixe, palan à incorporer |
| 15 Seilzug mit Einschienenfahrwerk "kurze Bauhöhe" | 15 Wire rope hoist with "short headroom" monorail trolley | 15 Palan à chariot monorail, "hauteur perdue réduite" |
| 16 Seilzug mit Zweischienenfahrwerk | 16 Wire rope hoist with double rail crab | 16 Palan à chariot biraill |

Füße unten
Feet at bottom
Pieds en bas
Pies abajo
Pés inferiores
Fissaggio in basso
Bevestiging aan de onderkant

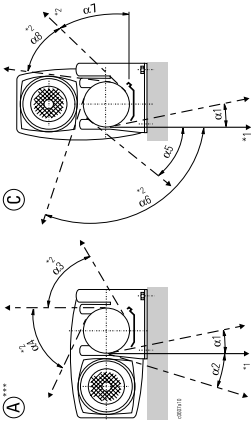
		1/1, 2/2	
		SH 3	SH 4
$\alpha 1$	4°	5°	8°
$\alpha 2$	23°	13°	20°
$\alpha 3$	27°	30°	30°
$\alpha 4$	74°	73°	76°
$\alpha 5$	30°	30°	25°
$\alpha 6$	113°	108°	110°
$\alpha 7$	83°	81°	60°
$\alpha 8$	11°	12°	18°
$\alpha 9$	24°	26°	30°
$\alpha 10$	7°	7°	8°
$\alpha 12$	90°	90°	90°

Siehe auch Seite 20
See also page 20
Voir aussi page 20

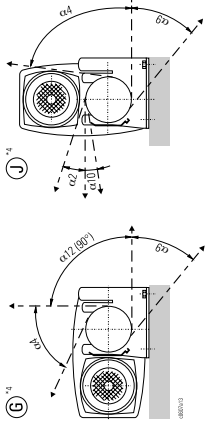
Seilabgangswinkel

Rope departure angles

Angles de sortie de câble



SH 3
SH 4
SH 5
SH 6



*** Vorzugsinbauweise
*1 Standard
*2 Bei Verdrehen des Seilführungs-
rings
*4 Bei Verdrehen des Seilführungs-
rings und der Fettwanne
(SH 3, SH 4, SH 5)
SH 6: Ausführung G, H, nicht mög-
lich

*** Preferential installation position
*1 Standard
*2 By turning rope guide
*4 By turning rope guide and grease
pan (SH 3, SH 4, SH 5)
SH 6: version G, H, not possible

*** Position préférentielle de montage
*1 Standard
*2 En cas de rotation du guide-câble
*4 En cas de rotation du guide-câble
et du carter à graisse
(SH 3, SH 4, SH 5)
SH 6: exécution G, H, pas possible

(Fortsetzung)

(Continue)

(Suite)

Der Seilführungsring muss ent-
sprechend dem Seilabgangs-
winkel eingestellt sein. Dabei auch
den radialen Seilaustrittswinkel γ
beachten.

The rope guide must be adjusted
to the fleet angle. Observe also the
radial rope exit angle γ .

Régler la bague guide-câble en
fonction de l'angle de départ du
câble. Observer alors aussi l'angle
radial de sortie du câble γ .

Typ Type	
SH 3	γ
SH 4	53°
SH 5	60°
SH 6	53°
	54°

Aufstellwinkel

Seilzug im zulässigen Winkel-
bereich montieren. Bei Seil-
trieben mit Hakengeschirr oder
Hakenflasche den Seilzug immer
waagrecht in der Längsachse
aufstellen.

Angles of installation

Install the wire rope hoist within
the permissible range of angles.
Hoist with rope drives with
bottom hook blocks must
always be installed horizontal to
the longitudinal axis.

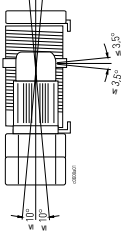
Angle de montage

Monter le palan dans les limites
angulaires admissibles. En cas
de mouflage avec bloc-crochet
ou moufle, monter toujours le
palan horizontalement dans
l'axe longitudinal.

Der max. zulässige Seilaustritts-
winkel ist bei nicht drehungs-
armen Seilen (nach Norm) 4° für
drehungsarme Seile 1,5°. Kleiner
Seilwinkel erhöhen die Seil-
lebensdauer. Ein Streifen des Sei-
les an der Seilführung oder an
Konstruktionsteilen ist nicht er-
laubt.

The max. permissible fleet angle
is 4° for non twist-free ropes
(acc. to standard). 1.5° for twist-
free ropes. Smaller fleet angles
increase the lifetime of the rope.
The rope must not graze the rope
guide or parts of the structure.

Respecter l'angle maximal de
sortie admissible : 4° pour les
câbles non antitortoirs (selon
la norme) et 1,5° pour les
câbles antitortoirs. Des
angles plus petits du câble
augmentent sa durée de vie. Le
câble ne doit pas frotter contre
le guide-câble ou des éléments
de la construction.



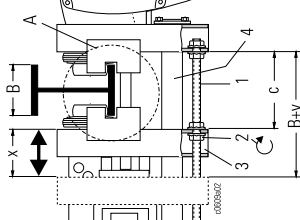
Untergurtfahrwerk

Monorail trolley

Chariot sur membre inférieure

avec palans SH 3, SH 4, SH 5

- Flanschbreite "B" und lichte Weite "c" anhand der Tabelle überprüfen und Fahwerk ggf. auf die Trägerbreite einstellen.

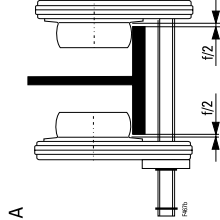


Achtung! Eine Veränderung der Flanschbreite (bausets) macht unter Umständen eine Veränderung des Gegengewichts notwendig um ein Kippen des Fahrwerkes zu vermeiden. Bitte durch unseren Kundenservice prüfen lassen.

Montage bei freizugänglichem Laufbahne

Installation if end of runway is freely accessible

- Fahwerk am Laufbahne ein-schieben und Spurspiel f/2 prüfen.



Montage bei unzugänglichem Laufbahne

Installation if end of runway is not accessible

- Muttern (2) der Gewindebolzen (1) soweit lösen und das Fahrwerks-teil (3) um ca. X mm nach außen schieben bzw. bis das Maß "B+Y" erreicht ist.
- Fahwerk auf der Seilzugseite in den Unterflansch des Laufbahn-trägers einhängen und gegen Her-ausutschen sichern.
- Fahrwerksteil (3) auf dem Tragbol-zen (4) Richtung Laufbahnträger schieben.
- Mit Muttern (2) das Maß "c" ein-stellen, Muttern (2) anziehen.
- Spurenstellung "c" und Spurspiel "f/2" überprüfen.
- Muttern (2) mit Drehmomentschlüs-sel anziehen.

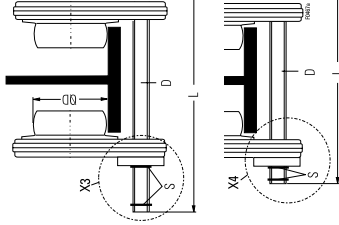
Anzugsmomente ↑ Tabelle.

ØD mm	*1	I	I	I	I	I	c	f/2	x	y	C Nm
		INP	IPE	IPB	IPB	*			mm		
80	KE-S33	B = 90...500	B = 90...500	B = 90...500	B = 90...500	B = 90...500	B+67 *2	1,5	70	137	210
100	KE-S44						B+67 *2	1,5	80	147	210
140	KE-S65	B = 119...500	B = 119...500	B = 119...500	B = 119...500	B = 119...500	B+67 *2	1,5	95	162	210

*1 Fahrwerkstyp
*2 bei 1 - Träger-2 mm*1 Type of trolley
*2 on 1 beam-2 mm*1 Type de chariot
*2 En cas de fer en 1 : 2 mm

Durchtrieb für Fahrantrieb

- In Abhängigkeit von der Flanschbreite (B) des Laufbahnträgers und der Länge (L) des Durchtriebs (D) den Durchtrieb in Einbaulage X3 oder X4 einbauen.
- Sicherungsringe (S) einbauen. Siehe Skizze und Tabelle.



ØD [mm]	B [mm]	*3	
		L [mm]	*4
80	90 - 145	390	X3 -
	146 - 195	-	X4
	196 - 250	495	X3 -
	251 - 306	-	X4
100	307 - 350	595	X3 -
	351 - 399	-	X4
	400 - 450	695	X3 -
	451 - 500	-	X4
140	119 - 145	505	X3 -
	146 - 200	-	X4
	201 - 250	505	X3 -
	251 - 306	-	X4
	330 - 400	710	X3 -
	401 - 500	-	X4

Abtre traversant de l'entraînement de translation

- Fit drive shaft in installation position X3 or X4 depending on the flange width (B) of the runway girder and the length (L) of the drive shaft (D).
- Fit circlips (S). See sketch and table.

Poser les circlips (S). Voir croquis et tableau.

Drive shaft for travel drive

- Fit drive shaft in installation position X3 or X4 depending on the flange width (B) of the runway girder and the length (L) of the drive shaft (D).
- Fit circlips (S). See sketch and table.

*3 Durchtrieb für Fahrantrieb
*4 Einbaulage*3 Drive shaft for travel drive
*4 Installation position*3 Abtre traversant pour entraînement de translation
*4 Position de montage

Untergurfahrwerk für 1/1

Monorail trolley for 1/1

Chariot monorail pour 1/1

mit Seilzügen SH 4, SH 5

with hoists SH 4, SH 5

avec palans SH 4, SH 5

- Flanschbreite „B“ und lichte Weite „c+z2“ anhand der Tabelle überprüfen und Fahrwerk ggf. auf die Trägerbreite einstellen. Hierbei beachten, dass sich das Verbindungsteil (Verkanthohr) mittig von Maß „c“ zwischen den Fahrwerkschildern („z1“ = „z2“) befindet.
 - Nach Lösen von Muttern (3) mit Muttern (2) lichte Weite „c+z2“ einstellen und Muttern (3) anziehen.
 - Muttern (3) mit Drehmoment schlüssel anziehen. Anzugsmomente ↑ Tabelle.
 - Die lichte Weite „c“ ergibt pro Seite ein Spurkranzspiel von „f/2“¹. Bei Bedarf Spurkranzspiel über lichte Weite „c“ korrigieren.
- Check flange width 'B' and clearance 'c+z2' against the table and set trolley to beam width if necessary. Ensure that the connection piece (square tube) is in the centre (of dimension 'c') between the trolley side cheeks ('z1' = 'z2').
 - After unscrewing nuts (3) together with nuts (2), adjust clearance 'c+z2' and tighten nuts (3).
 - Tighten nuts (3) with torque wrench. Tightening torques - table.
 - Clearance 'c' results in a flange play of 'f/2'¹ on each side. If necessary, correct flange play by means of clearance 'c'.

Montage bei frei zugänglichem Laufbühnenende

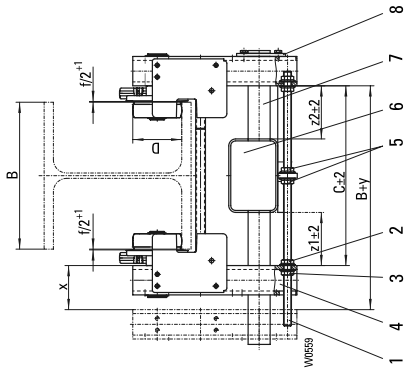
- Fahrwerk am Laufbühnenende einschrauben und Spurspiel f/2 prüfen.

Installation if end of runway is freely accessible

- Slide trolley onto end of runway and check play f/2.

Montage en cas d'extrémité de chemin de roulement librement accessible

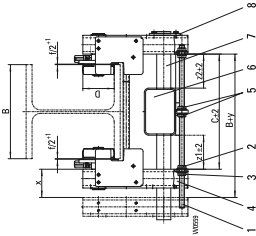
- Engager le chariot sur l'extrémité du chemin de roulement et contrôler le jeu d'écartement f/2.



ØD	*1	I	I	I	I	I	I	f/2	x	y	C
mm		INP	IPE	IPB	.			mm	mm		Nm
100	UE-S4	B=90...500	B=67	1,5	75	142	210				

Montage bei unzugänglichem Laufbühnenende

- Muttern (3) der Gewindebolzen (1) im Rechteckrohr der Fahrwerkschilder (4) lösen und Maß „x“ herausdrehen.
- Fahrwerkschilder (4) parallel bis zu den herausgedrehten Muttern (3) auseinander schieben bis das Maß „B+y“ bzw. „c+x“ erreicht ist und das de connexion (tuyau carré) soit Fahrwerk von unten in die Fahrbahn heben.
- Fahrwerk auf der Achshalterseite (8) in den Unterflansch des Laufbahnträgers einhängen und gegen Herunterrutschen sichern.
- Fahrwerkschilder (4) an die Muttern (2) zurückschieben, Muttern (3) zurückdrehen und anziehen.
- Spureinstellung „c+z2“ und Führungsspielspiel „f/2“ überprüfen.
- Muttern (3) mit Drehmoment schlüssel anziehen. Anzugsmomente ↑ Tabelle.



Installation if end of runway is not accessible

- Loosen nuts (3) on threaded bolts (1) in the square tube of the trolley side cheeks (4) and unscrew by dimension 'x'.
- Push trolley side cheeks (4) apart in parallel up to the unscrewed nuts (3) until dimension 'B+y' or 'c+x' is reached, and lift trolley onto runway from below.
- Slide trolley onto the bottom flange of the runway beam on the axle keep plate side (8) and secure against shifting.
- Push trolley side cheeks (4) back to nuts (2), rescrew and tighten nuts (3).
- Check track gauge 'c+z2' and play of guide rollers 'f/2'.
- Tighten nuts with torque wrench. Tightening torques ↑ table.

Centering connection piece

- Loosen nuts (5) and shift connection piece (6) on connecting bolt (7) so that dimensions 'z1' and 'z2' between the trolley side cheeks (4) and the connection piece (6) are equal on both sides.
- Tighten nuts (5) with torque wrench. Tightening torques ↑ table.

Centrage de la pièce de connexion

- Desserrer les écrous (5) et pousser la pièce de connexion (6) sur le boulon de connexion (7) jusqu'à ce que les cotes 'z1' et 'z2' entre les flasques latéraux du chariot (4) et la pièce de connexion (6) soient égales des deux côtés.
- Serrer les écrous (5) avec une clé dynamométrique. Pour couples de serrage, ↑ tableau.

ØD	*1	I	I	I	I	I	I	c+z2	f/2	x	y	C
mm		INP	IPE	IPB	.			mm	mm	mm		Nm
100	UE-S4	B=90...500	B=67	1,5	75	142	210					

Verbindungsbolzen und Durchtrieb

- Verbindungsbolzen und Durchtrieb passend zu Trägerbereich „B“ verwenden.

Connecting bolt and drive shaft

- Use connecting bolt and drive shaft suitable for beam range "B".

Boulon de connexion et arbre d'entraînement

- Utiliser le boulon de connexion et l'arbre d'entraînement justes pour la plage du profilé "B".

*1 Fahrwerkstyp

*2 bei INP-Träger: -2mm

*1 type of trolley

*2 with INP beam: -2mm

*1 Type de chariot

*2 en cas de fer INP: -2 mm

Montaje del polipasto de cable

Montando o diferencial de cabo

Installazione del paranco elettrico a fune

Staaldraadtakel monteren

Interruptor final de carrera de traslación

Carro monorail
Los interruptores de final de carrera de traslación están montados en el mecanismo de traslación.

Carro birrail

La construcción adicional del interruptor final de carrera se suministra instalada pero sin fijar y debe fijarse en el brazo del arrastrador de alimentación de corriente.

Los contactos de mando están concebidos para la tensión de mando.

Función lógica:
Desconexión previa y final en ambos sentidos de marcha. La desconexión previa cambia antes de llegar al final de la vía de deslizamiento de "rápido" a "lento", al final de la vía de deslizamiento se desconecta el carro.

X = stop, izquierda
Y = stop, derecha
Z = rápido / lento

Interruptores de fin de curso de traslación

Carro monoviga
Os interruptores de fin de curso de traslação encontram-se montados no carro.

Carro biviga

O módulo do interruptor de fim de curso é fornecido montado mas solto e tem que ser fixado na lança do carro de arrastamento da alimentação eléctrica.

Os contactos de ligação são concebidos para correntes de comando.

Funcção de ligação:
Desconexão no início e no fim do curso em ambas as direcções de traslação.

A desconexão no início do curso muda a velocidade de "rápido" para "lento" antes do fim da pista e no fim desta o aparelho é desligado.

X = parar / esquerda
Y = parar / direita
Z = rápido / lento

Finecorsa di traslazione ad azionamento magnetico

Carrello monotrave
I finecorsa di traslazione ad azionamento magnetico sono installati sul carrello.

Carrello bitrave

Si dovrà installare il componente con l'interruttore di finecorsa, dato che esso viene fornito montato ma non fissato, esso si dovrà fissare sul braccio del trascinatori dell'alimentazione di corrente.

I contatti del finecorsa sono dimensionati per corrente ausiliaria.

Funzionamento:
è previsto il passaggio da alta a bassa velocità e l'interruzione della corsa a fine rotale in entrambe le direzioni.

X = stop sinistra
Y = stop destra
Z = lento / veloce

Rijwielenschakelaar

Enkeltligger-rijwerk
De rijwielenschakelaar is aan de loopkat bevestigd.

Dubbeltligger-rijwerk

De bevestiging voor de rijwielenschakelaar wordt geïnstalleerd maar los geleverd en moet aan de arm van de aandrijvingsmeenmer worden gemonteerd.

Het schakелеlement is geschikt voor stuurstroom.

Schakelfuncties:
Voor- en eindafschakeling in beide rijrichtingen.

De voor-afschakeling schakelt van "snel" naar "langzaam", aan einde baan wordt er uitgeschakeld.

X = stop, links
Y = stop, rechts
Z = snel / langzaam

Zweischienenfahrwerk

Double rail crab

Chariot birrail

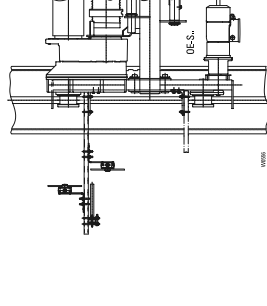
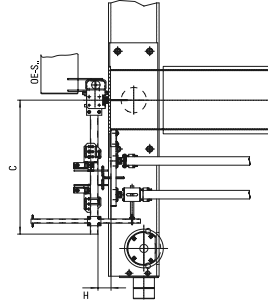
Carro birrail

Carro biviga

Carrello bitrave

Dubbeltligger-rijwerk

Type	H	C
Type		
tipo		
OE-S 04	77	795
OE-S 05	85	915
OE-S 06	87	915
OE-S 07	107	915



- *1 Schalterbetätigung bauseits
- *1 Switch activator by customer
- *1 Mécanisme d'actionnement des interrupteurs par les soins du client
- *1 Accionamiento del interruptor por parte del cliente
- *1 Accionamento do interruptor por parte da empresa construtora
- *1 L'azionamento dell'interruttore avverrà da parte dell'utilizzatore
- *1 Schakelbediening van klant

Seilzug montieren

Installing wire rope hoist

Montage du palan

Elektrische Einrichtungen

Electrical equipment

Équipement électrique



Aus Sicherheitsgründen den Seilzug nur durch eine Elektrofachkraft anschließen lassen. Dabei die einschlägigen Sicherheitsbestimmungen und Unfallverhütungsvorschriften beachten!

For the sake of safety, have the wire rope hoist connected by a skilled electrician. Observe the relevant safety and accident prevention regulations!

Pour des raisons de sécurité, ne faire brancher le palan que par un électricien de métier. Observer alors les consignes de sécurité et consignes de prévention des accidents s'appliquant dans ce cas !

Zuleitung

- Für festverlegte Leitungen: NY, NYM.
- Für bewegliche Leitungen: H07RN-F oder NGF-LG6u, H07VH2-F oder gleichwertige Leitungen.
- Mindestquerschnitt und max. Zuleitungslänge ↑ 116.

Supply cable

- For fixed installed cables: NY, NYM.
- For flexible cables: H07RN-F or NGF-LG6u, H07VH2-F or equivalent cables.
- ↑ 116 for minimum cross-section and max. length of supply cable.

Ligne d'alimentation

- Pour lignes fixées à demeure : NY, NYM.
- Pour lignes mobiles : H07RN-F ou NGF-LG6u, H07VH2-F ou lignes équivalentes.
- Pour section minimale et longueur max. de la ligne d'alimentation, ↑ 116.

Abseicherung

- NEOZED-, DIAZED- oder NH-Sicherungen der Betriebsklasse gl, ↑ 112.
- Sicherungswerte einhalten, damit auch im Kurzschlussfall keine Verschweißungen an den Kontakten des Kranschalterschützes auftreten.

Fusing

- NEOZED, DIAZED or NH fuses in operating class gl, ↑ 112.
- Observe fuse sizes so that the crane switch contacts do not weld if there is a short circuit.

Protection par fusibles

- Coupe-circuits NEOZED, DIAZED, ou B.T à haut-pouvoir de coupure de la classe d'exploitation gl, ↑ 112.
- Respecter les valeurs nominales des fusibles afin que, même en cas de court-circuit, il n'y ait pas de soudages des contacts du contacteur de l'interrupteur du pont roulant.

NOT-HALT

Vom Bedienungsstandort muss die Anlage elektrisch abschaltbar sein. Diese Aufgabe übernehmen:

- NOT-HALT-Taster im Steuergerät in Verbindung mit dem Kranschalterschütz,
- Netzanschlusssschalter, wenn nahe und direkt zugänglich am Bedienungsstandort platziert.

EMERGENCY STOP

It must be possible to disconnect the system electrically from the operating position. This function can be provided by:

- EMERGENCY STOP button in the control pendant in conjunction with the crane switch contactor,
- main isolator, if this is positioned close to the operating position and is freely accessible.

EMERGENCY STOP

A partir du poste de commande, il doit être possible de couper l'alimentation électrique de l'installation. Cette fonction est assurée par :

- Touche d'ARRÊT D'URGENCE dans le boîtier de commande, en combinaison avec le contacteur de l'interrupteur du pont roulant,
- interrupteur de branchement sur le secteur, s'il est placé librement accessible à proximité du poste de commande.

Netzanschlusschalter

- muss den Seilzug allpolig abschalten,
- muss in AUS- Stellung abschaltbar sein,
- muss an leicht zugänglicher Stelle der Anlage montiert sein, ist zu kennzeichnen, um Verwechslungen zu vermeiden.

Main isolator

- must disconnect the wire rope hoist on all poles,
- must be lockable in OFF position,
- must be installed in an easily accessible place in the system, must be marked as such to avoid mistakes.

Interrupleur de branchement sur le secteur

- Doit déconnecter tous les pôles du palan.
- Doit pouvoir être verrouillé en position ARRET.
- Doit être monté en un lieu facilement accessible de l'installation.
- Doit être repéré afin d'éviter des confusions.

Trennschalter

- ist erforderlich, wenn mehr als ein flurbedientes Hubwerk gespeist wird,
- muss in AUS- Stellung abschaltbar sein.

Disconnecting switch

- is necessary if more than one floor-operated hoist is supplied,
- must be lockable in OFF position.

Sectionneur

- Est requis en cas d'alimentation de plus d'un palan commandé à partir du sol
- Doit pouvoir être verrouillé en position ARRET.



Überlastabschaltung
verhindert das Anheben einer Überlast. Nach erkannter Überlast kann die Last nur abgesenkt werden.
In speziellen Einsatzfällen können Seilzüge auch ohne Überlastabschaltung eingesetzt werden. Sie entsprechen dann jedoch nicht den EU-Richtlinien und tragen nicht das CE-Zeichen.

Overload cut-off
prevents an overload being lifted. The load can only be lowered if an overload has been established. In special applications, wire rope hoists may also be used without an overload cut-off. However, in this case they do not fulfil the EU directives and are not marked with the CE symbol.

Arrêt automatique en cas de surcharge
Empêche le levage d'une surcharge. Si une surcharge est constatée, il est seulement possible de faire descendre la charge.
Dans des cas spéciaux d'utilisation, des palans peuvent être utilisés aussi sans arrêt automatique en cas de surcharge. Cependant ils ne satisfont pas alors aux directives de l'Union Européenne et ne portent pas le label CE.

Lastmessung am Seilfestpunkt

SLM1: mit Feder und Mikroschalter
Die Überlastabschaltung ist auf Nennlast + 10-15% Überlast eingestellt. Im Bedarfsfalle kann diese Einstellung verändert werden. ↑ 80.

Load measurement at rope anchorage
SLM1: with spring and microswitch
The overload device is set to nominal load +10-15% overload. If required, this setting can be altered. ↑ 80.

Mesure de la charge au point de fixation du câble
SLM 1 : avec ressort et interrupteur miniature
L'arrêt automatique en cas de surcharge est réglé sur la charge nominale + 10-15% de surcharge. Si nécessaire, il est possible de modifier ce réglage. ↑ 80.

SLE1: mit Elektroniksensor

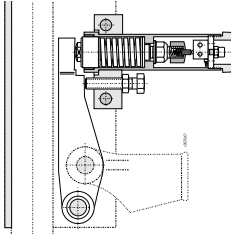
Die Überlastabschaltung ist auf Nennlast + 10% Überlast eingestellt.
Die Einstellung der Überlastabschaltung SLE1 mit dem Sensor LHB wird komplett im Werk vorgenommen und darf nicht verändert werden.

SLE1: with electronic sensor

The overload device is set to nominal load +10% overload. The overload cut-off SLE1 and sensor LHB are set in the works; this setting must not be altered.

SLE 1: avec capteur électronique

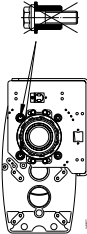
L'arrêt automatique en cas de surcharge est réglé sur la charge nominale + 10 % de surcharge. Le réglage du système d'arrêt automatique en cas de surcharge SLE1 avec le capteur LHB est effectué complètement en usine et ne doit pas être modifié.



SH. mit Überlastabschaltung LEI-SLE1

SH. with overload cut-off LEI-SLE1

SH. avec système d'arrêt automatique en cas de surcharge LEI-SLE1



Die rot markierten Transportsicherungen nach der Seilzugmontage und vor Inbetriebnahme entfernen.

After installation and before commissioning the hoist, remove the transport anchor screws marked in red.

Après le montage et avant la mise en service du palan, enlever les vis d'arrêt de transport marquées en rouge.

Bauseitige Steuerung
• Bei bauseitiger Steuerung die Bremse, die Temperaturfühler des Hubmotors, die Überlastabschaltung und den Hub-Notenschalter entsprechend den Anschlussplänen einbeziehen.
• Keine spannungsführende Leitung an die Temperaturfühler anschließen! Beschädigte Temperaturfühler können den Motor nicht schützen.

Controls by client
• If controls are supplied by the client, integrate the brake, the temperature sensors of the hoist motor, the overload cut-off and the emergency hoist limit switch according to the connection diagrams.
• Do not connect any live cables to the temperature sensors! Damaged temperature sensors cannot protect the motor.

Commande fournie par le client
• En cas de commande fournie par le client: intégrer le frein, les sondes de température du moteur de levage, le système d'arrêt automatique en cas de surcharge et l'interrupteur d'arrêt d'urgence de levage, conformément aux schémas de branchement.
• Ne pas raccorder de fil sous tension aux sondes de température ! Des sondes de températures détériorées ne peuvent pas protéger le moteur.

Netzanschluss

- Vorhandene Netzspannung und Frequenz mit der Angabe auf dem Typenschild vergleichen.
- Steuerspannung durch Messung überprüfen. Überschreitet der Messwert die Nenn-Steuerspannung um mehr als 10%, ist primärseitig am Steuertransformator eine entsprechende andere Anzapfung zu wählen.
- Zuleitungen durch die Leitungseinführungen in den Anschlussraum am Seilzug einführen.
- Nach mitgelieferten Stromlaufplänen anschließen, ↑ 122.
- Prüfen, ob Drehrichtung der Seiltrommel den Symbolen am Steuergerät entspricht.
- Dazu "Feinheben" am Steuergerät drücken. Niemals "Senken" zuerst drücken!
- Wenn der Lasthaken sich nach oben bewegt oder keine Bewegung ausgeführt wird, weil der Endscharter in höchster Hakenstellung abgeschaltet hat, ist der Seilzug phasenrichtig angegeschlossen.
- Als Gegenprobe "Feinsenken" am Steuergerät drücken.

Entspricht die Hakenbewegung nicht den Symbolen am Steuergerät, zwei Außenleiter der Zuleitung vertauschen.

Achtung! Unfallgefahr!

Nichtbeachtung kann zu schweren Unfällen und zur Beschädigung des Seilzuges führen!

Mains connection

- Compare the mains voltage and frequency with that given on the rating plate.
 - Measure control voltage. If the measured value exceeds the nominal control voltage by more than 10%, a different tapping must be selected on the primary side of the control transformer.
 - Lead cables into the hoist terminal box via the cable glands.
 - Connect according to the circuit diagrams supplied, ↑ 122.
 - Check that the direction of rotation of the rope drum corresponds to the symbols on the control pendant.
 - Press "slow up" on the control pendant. Never press "down" first!
 - If the load hook moves upwards or does not move because the limit switch has switched off in highest hook position, the phases are correctly connected.
 - Counter-check by pressing "slow down" on the control pendant
- If the movement of the hook does not correspond to the symbols on the control pendant, inter-change two phase conductors of the supply cable.**

Caution! Danger of accident!

If this is not observed, serious accidents or damage to the hoist may occur!

Branchement sur le secteur

- Comparer la tension et la fréquence de secteur existantes avec celles figurant sur la plaque signalétique.
 - Vérifier par mesure la tension de commande. Si la valeur mesurée dépasse de plus de 10 % la tension nominale de commande, la tension nominale de commande, choisir côté primaire du transformateur de commande, un branchement qui convient.
 - Passer les lignes d'alimentation dans les entrées de lignes et les introduire dans le boîtier de branchement du palan.
 - Faire le branchement conformément aux schémas des connexions joints à la fourniture, ↑ 122.
 - Vérifier si le sens de rotation du tambour à câble correspond aux symboles figurant sur le boîtier de commande.
- À cet effet, actionner "Lavage très lent", sur le boîtier de commande. Ne jamais actionner d'abord "Descente" !
- Si le crochet se déplace vers le haut ou n'effectue aucun mouvement parce que l'interrupteur de fin de course a été connecté à la position la plus élevée du crochet, l'ordre des phases du branchement est correct.
- Comme essai inverse, actionner "Descente très lente", sur le boîtier de commande.

Si le déplacement du crochet ne correspond pas aux symboles se trouvant sur le boîtier de commande, intervertir deux fils extérieurs de la ligne d'alimentation.

Attention ! Risque d'accident !

La non-observation peut avoir pour conséquences de graves accidents et la détérioration du palan !

Seil einsichern

- Das Drahtseil ist ab Werk auf die Seiltrommel aufgewickelt. Wenn nicht, ↑ 94. "Drahtseil aufliegen". Ist die Hakenflasche nicht eingesichert, wie folgt vorgehen:
- Mit einer Gripzange können Sie das Seil sicher fassen.
 - Zum Einsichern des Drahtseiles muss der Seilzug eingeschaltet werden. Deshalb alle Arbeiten mit höchster Sorgfalt vornehmen: Zu Ihrer Sicherheit und zur störungsfreien Funktion des Seilzuges!
1. Das nicht aufgewickelte Seilende auslegen bzw. frei aushängen lassen.
 2. Prüfen, ob das Drahtseil stramm auf der Seiltrommel aufliegt, ggf. noch spannen. **Schlupfseil auf der Seiltrommel vermeiden! Schlupfseil kann die Seilführung und das Drahtseil zerstören.**
 3. Seilanfang auf einer Seite farblich markieren.
 4. Seilanfang in die Seilrolle(n) der Hakenflasche bzw. Umlenkrolle(n) einsichern, ↑ 46 (1-8). **Dabei das Seil nicht verdrehen:** die Farbmarkierung erleichtert die Kontrolle.
 5. Seilende im Seilfixpunkt befestigen, ↑ 48 - 50 (12-37).
 6. Mehrere Leerfahrten über die volle Hubhöhe ausführen.
 7. Dasselbe mit steigender Belastung.
 8. Eventl. aufgetretenen Drill im Seil durch eine aufgelebte Papierfahne sichtbar machen. Ein stärkerer Drill zeigt sich durch Verdrehen der Hakenflasche, insbesondere im unbelasteten Zustand.
 9. Bei Auftreten eines Dralls, Drahtseil wieder aussichern und durch Aushängen oder Auslegen entdrallen. Ein Drill im Drahtseil beeinträchtigt die Sicherheit und Haltbarkeit.

Beseitigen Sie deshalb jeden Drill vor jeder weiteren Belastung, denn das Seil wird sonst bleibend verformt und muss eventl. ausgetauscht werden!



Reeving rope

The wire rope is wound onto the drum by the works. If not, ↑ 94. "Fitting wire rope".

- Gripper pliers hold the rope securely.
- The wire rope hoist must be switched on in order to reeve the rope. Thus all work must be carried out with the greatest care: for your safety and for troublefree functioning of the wire rope hoist!

1. Lay out the end of the rope not wound on the drum, or let it hang freely.
2. Check that the wire rope lies snugly on the rope drum, tighten if necessary. **Avoid slack rope on the drum! Slack rope can destroy the rope guide and the wire rope.**
3. Colour code the beginning of the rope on one side.
4. Reeve the beginning of the rope into the rope sheave(s) of the bottom hook block and return pulley(s), ↑ 46 (1-8). **Do not twist the rope:** the colour coding facilitates checking.
5. Fasten the end of the rope in the rope anchorage, ↑ 48 - 50 (12-37).
6. Perform several runs over the full height of lift without load.
7. Repeat with increasing loads.
8. Mark any twisting in the rope with a paper tag. Severe twisting is shown by the bottom hook block's twisting, especially when not under load.
9. If twisting should occur, remove the wire rope and untwist by letting it hang freely or laying it out. Twisting in the wire rope prejudices safety and service life.

Any twisting should therefore be removed before subjecting the hoist to any further load. The rope could otherwise be permanently distorted and might have to be replaced!

Mouflage du câble

Au départ de l'usine, le câble est enroulé sur le tambour. Sinon, ↑ 94. "Pose du câble".

- Une pince-étau vous permet de tenir fermement le câble.
- Pour le mouflage du câble, le palan doit être enclenché. Aussi faut-il procéder avec la plus grande précaution : pour votre sécurité et pour assurer un fonctionnement sans dérangements du palan !








1. Poser sur le sol ou laisser pendre l'extrémité du câble qui n'est pas enroulée.
2. Vérifier si le câble est appliqué sans mou contre le poulie, sinon le tendre davantage. **Éviter que le câble ait du mou sur le tambour ! Sinon il peut s'ensuivre une détérioration du guide-câble et du câble.**
3. Apposer un repère de couleur sur un côté du commencement du câble.
4. Enfiler le commencement du câble dans la/les poulie/s de la moufle porte-crochet ou de la/les poulie/s de renvoi, ↑ 46 (1-8). **Ce faisant, ne pas vriller le câble;** le repérage en couleur facilite le contrôle.
5. Fixer la fin du câble dans son point de fixation, ↑ 48 - 50 (12-37).
6. Effectuer plusieurs courses à vide sur toute la hauteur de levage.
7. Répéter l'opération avec une charge croissante.
8. S'il s'est produit un vilage du câble, le mettre en évidence en collant une bande de papier. Un vilage assez important se traduit par un décalage angulaire de la moufle porte-crochet, particulièrement à l'état sans charge.
9. S'il apparaît un vilage, dévider complètement le câble et le dévriller en le laissant pendre ou en l'étendant sur le sol. Un vilage du câble compromet la sécurité et la durabilité.

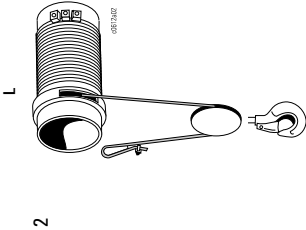
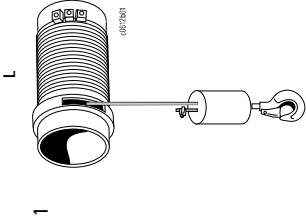
Aussi faut-il éliminer tout vilage avant de prendre une autre charge, sinon le câble subira une déformation permanente et devra éventuellement être remplacé !








Seil einscheren

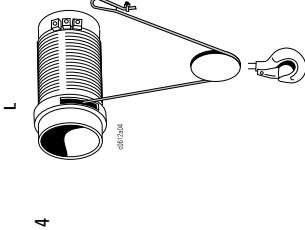
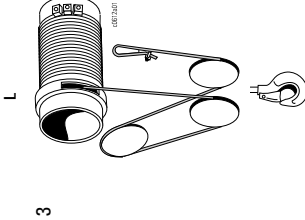
Reeving rope








Mouflage du cable

			SH 3 - SH 5		SH 6
					
1/1	1	2	3	4	5
2/1	6	7	8		



			SH 3 - SH 5		SH 6
					
2/1	4	5	8	4	5
4/1					
2/2-1					



			SH 3 - SH 5		SH 6
					
2/1	4	5	8	4	5
4/1					
4/2-1					

L=Linksgewinde
R=Rechtsgewinde

R = Right-hand thread
L = Left-hand thread

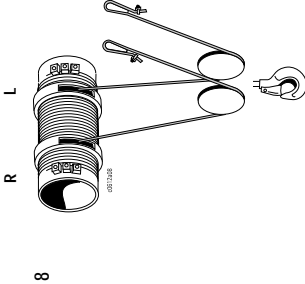
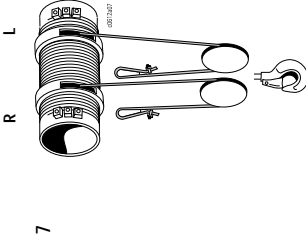
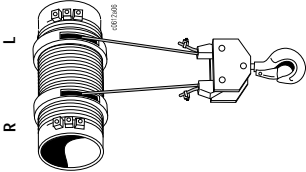
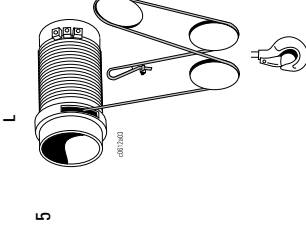
R = Pas à droite
L = Pas à gauche

Cable de acero

Enfilando o cabo

Rinvii funi

Staaldraad inscheren



R = Ranura derecha
L = Ranura izquierda

R = Rosca a direita
L = Rosca esquerda

R = Scanalatura destra
L = Scanalatura sinistra

R = Rechtse spoed
L = Linkse spoed

Seilfestpunkt

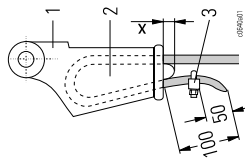
- Hinweis: Seilfestpunkt je nach Einspannung einzeichnen, siehe Skizzen 35-37 und Tabellen.
- Seil um den Seilkeil (2) legen und in die konische Seiltasche (1) ziehen, bis das lose Seilende ca. 100 mm herausragt.
- Loses Seilende mit Seillemme (3), ca. 50 mm vom Seilende entfernen, sichern.
- SH 6: x_{max} 15mm

Rope anchorage

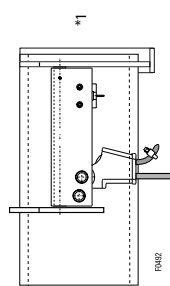
- Note information plate at rope anchorage.
- Insert end of rope into rope reeving, see sketches 35-37 and tables.
- Place rope around the rope wedge (2) and pull it into the tapered rope recess (1) until the loose end of the rope projects by approx. 100 mm.
- Secure loose end of rope with rope clamp (3) approx. 50 mm from the end of the rope.
- SH 6: x_{max} 15mm

Point fixe du câble

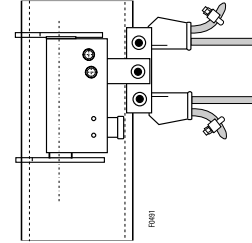
- Observer la plaque signalétique se trouvant sur le point fixe du câble.
- Introduire l'extrémité du câble dans le point fixe en fonction du mouflage, voir croquis 35 à 37 et tableaux.
- Faire passer le câble autour du coin de câble (2) et le tirer dans la cosse à coin (1) jusqu'à ce que le bout libre du câble dépasse d'environ 100 mm.
- Fixer un serre-câble (3) servant d'arrêt sur le bout libre du câble à environ 50 mm de l'extrémité du câble.
- SH 6: x_{max} 15mm



	SH 6			
2/1	4	12-15	36	
4/1	5	12-15	35	
2/2-1	6			
4/2-1	8	12-15	37	

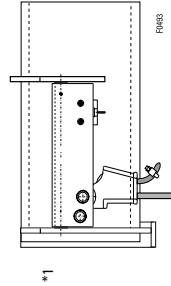


35



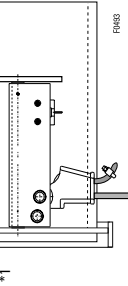
37

36



36

	SH 6			
2/1	4	12-15	24	
4/1	5	12-15	23	
4/2-1	8	12-15	25	



36

	SH 6			
2/1	4	12-15	36	
4/1	5	12-15	35	
4/2-1	8	12-15	37	



36

Pflichten des Kranführers

Beim Arbeiten mit Seilzügen ist zu beachten:

- Täglich vor Arbeitsbeginn Brensen und Endschalter prüfen und den Zustand der Anlage auf augenfällige Mängel hin beobachten.
- Bei Mängeln, die die Betriebssicherheit gefährden, Kranarbeiten einstellen.
- Dem Wind ausgesetzte Krane bei Arbeitschluss mit der Windsicherung festsetzen.
- Lasten nicht über Personen hinwegführen.
- Angehängte Last nicht unbeaufsichtigt lassen. Steuerriehrührung muss im Handbereich sein.
- Notendschalter nicht betriebsmäßig anfahren.
- Nicht über die Nenntragfähigkeit belasten.
- Schrägziehen oder Schleifen von Lasten sowie das Bewegen von Lastzeugen mit der Last oder Lastaufnahmeverrichtung sind verboten!
- Keine feststehenden Lasten losstellen.
- Endstellungen für Heben, Senken und Fahren nur dann betriebsmäßig anfahren, wenn ein Betriebsendschalter vorhanden ist.
- Tippschaltungen (kurze Einschaltungen des Motors zum Erreichen kleiner Bewegungen) möglichst vermeiden. Schaltgeräte und Motoren können dadurch Schaden erleiden.
- Nicht in die Gegenrichtung fahren bevor Stillstand erreicht ist.
- Sicherheitshinweise beachten, ↑ 4-12.



Duties of crane operator

When working with wire rope hoists, the following must be observed:

- Every day before starting work, check brakes and limit switches and inspect the system for any visible defects.
- Discontinue working with the crane if there are any defects which might prejudice its safety in operation.
- At close of work, secure cranes which are exposed to wind with the wind safeguard mechanism.
- Do not move loads above people.
- Do not leave suspended loads unattended. The control facility must be within easy reach.
- Do not use emergency limit switch during normal operation.
- Do not load above nominal capacity.
- Pulling loads at angles, dragging loads, or towing vehicles with the load or load bearing element are forbidden!
- Do not heave up any loads which are jammed.
- Approach final positions for hoisting, lowering, and travel only if an operational limit switch is fitted.
- As far as possible, avoid inching operation (briefly switching on the motor to achieve small movements). This could damage switchgear and motors.
- Do not move in the opposite direction until the hoist has come to a stop.
- Observe the safety instructions, ↑ 4-12.

Obligations de l'opérateur

Lors de travail avec des palans, il convient d'observer ce qui suit :

- Chaque jour, avant de commencer à travailler, contrôler les freins et les interrupteurs de fin de course, et inspecter le système pour tout défaut visible.
- L'installation ne présente pas de détériorités évidentes.
- En cas de détériorités compromettant la sécurité de fonctionnement, interrompre l'utilisation du palan.
- A la fin du travail, bloquer au moyen du dispositif contre le vent les palans exposés au vent.
- Ne pas faire passer les charges au-dessus de personnes.
- Une charge suspendue au crochet ne doit pas rester sans surveillance. L'opérateur doit garder à portée de la main le dispositif de commande.
- En fonctionnement normal, ne pas accoster les interrupteurs d'urgence de fin de course.
- Ne pas soulever des charges dépassant la capacité nominale de charge.
- Il est interdit de tirer obliquement ou de trainer des charges ou de déplacer des véhicules avec la charge ou avec le dispositif porte-charge !
- Ne pas arracher de charges adhérant au sol.
- En fonctionnement normal, n'aborder les positions extrêmes de levage, abaissement et pourvues d'un interrupteur de fin de course utile.
- Éviter le plus possible les couplages par impulsions (brefs enclenchements du moteur pour atteindre de petits déplacements). Cela peut entraîner un endommagement des appareils de couplage et des moteurs.
- Ne pas faire fonctionner en sens inverse jusqu'à l'arrêt complet du palan.
- Observer les consignes de sécurité, ↑ 4-12.

Dieser Abschnitt befasst sich mit der Funktionssicherheit, der Verfügbarkeit und Werterhaltung Ihres Seilzuges.

Obwohl dieser Seilzug weitestgehend wartungsfrei ist, müssen die ihm Verschieß unterworfenen Bauteile (Drahtseil, Bremse) einer regelmäßigen Prüfung unterzogen werden. Dies wird von den Unfallverhütungsvorschriften so verlangt.

Allgemeine Hinweise zum Prüfen und Warten

- Wartungs- und Reparaturarbeiten nur am unbelasteten Seilzug durchführen.
- Netzanschlussschalter vorher abschalten und abschließen.
- Die Bestimmungen der Unfallverhütungsvorschriften einhalten.
- Nach Ablauf der Nutzungsdauer ist eine Generalüberholung durchführen.
- Die Prüfintervalle in der Tabelle gelten für einen Einsatz entsprechend der Triebwerksgruppe 1Am. Bei einem Einsatz in Triebwerksgruppen 2m und 3m werden die Wartungsintervalle halbiert. Schmierstoffe und Schmierstellen, ↑ 118.



This section deals with the operational reliability, availability, and maintaining the value of your wire rope hoist.

Although this wire rope hoist is practically maintenance-free, the components subject to wear (wire rope, brake) must be inspected regularly. This is required by the accident prevention regulations.

General information on inspection and maintenance

- Maintenance and repair work may only be carried out when the wire rope hoist is unloaded.
- Switch off and lock main isolator beforehand.
- Observe the requirements of the accident prevention regulations.
- A general overhaul must be carried out after the useful life of the hoist has expired.
- The inspection intervals given in the table apply for use in mechanism group 1 Am. If the hoist is operated in mechanism group 2 m or 3 m, the maintenance intervals must be halved. Lubricants and lubrication points, ↑ 118.

Legende zur Prüftabelle Seite 58:

A Prüfung bei Inbetriebnahme
Diese sollten durch einen vom Hersteller beauftragten Monteur durchgeführt werden.

B Tagliche Prüfung durch den Benutzer vor Arbeitsbeginn

C Wiederkehrende Prüfungen einschließlich Wartungen alle 12 Monate, nach länderspezifischen Vorschriften unter Umständen früher, sind von einem vom Hersteller beauftragten Monteur durchzuführen.
Ebenso erfordert ein schwerer Einsatz und ungünstige Bedingungen (Verschmutzung, Lösungsmittel, Mehrschichtbetrieb, etc.) eine Verkürzung dieses Prüf- und Wartungsintervalls.

Legend for inspection table on page 58:

A Inspection on commissioning
This should be performed by a fitter engaged by the manufacturer.

B Daily inspection by the user before starting work.

C Periodic inspections including maintenance every 12 months, possibly earlier if so prescribed by national regulations, to be performed by a fitter engaged by the manufacturer.
Similarly, heavy-duty applications and adverse conditions (dirt, solvents, multi-shift operation, etc.) necessitate shortening the inspection and maintenance intervals.

Ce chapitre traite de la fiabilité, de la disponibilité, et du maintien de la valeur de votre palan. Bien que ce palan ne demande pratiquement pas d'entretien, les éléments soumis à une usure (câble, frein) doivent faire l'objet d'un contrôle régulier. Cela est exigé par les consignes de

Généralités pour le contrôle et l'entretien

- N'effectuer des travaux d'entretien et de réparation que sur le palan sans charge.
- Auparavant, ouvrir l'interrupteur de branchement sur le secteur et le condamner.
- Respecter les dispositions des consignes de prévention des accidents.
- Après écoulément de la durée d'utilisation, une révision générale est de rigueur.
- Les intervalles de contrôle figurant dans le tableau s'appliquent à une utilisation telle qu'elle est prévue pour les catégories de mécanismes mise en œuvre dans les catégories de mécanismes d'entraînement 2m et 3m, les intervalles d'entretien sont deux fois plus courts. Pour les lubrifiants et les points de lubrification, ↑ 118.

Legende du tableau de contrôle de la page 58:

A Contrôle à la mise en service
Doit être exécuté par un monteur délégué par le fabricant.

B Contrôle quotidien par l'utilisateur avant le début du travail

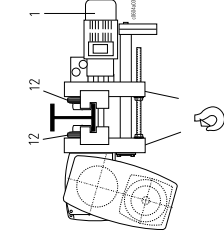
C Contrôles périodiques incl. entretien tous les 12 mois, le cas échéant plus tôt selon les consignes nationales, doivent être exécutés par un monteur délégué par le fabricant.
De même, une utilisation lourde et des conditions défavorables (encrassement, solvants, multi-shift opération, etc.) nécessitent un raccourcissement de cet intervalle pour les contrôles et l'entretien.

Seilzug prüfen und warten Inspecting and servicing Contrôle et entretenir du palan

Prüf- und Wartungstabelle					Tableau de contrôle et d'entretien
P.o.s.				* ↑	Dispositifs de sécurité
1	A	B	C	62	1 Frein
2	A	B	C	66	2 Interrupteur de fin de course de levage
3	A	B	C	34	3 ARRET D'URGENCE, interrupteur du palan
4	A		C	80	4 Système d'arrêt automatique en cas de surcharge
5	A		C	36	5 Sectionneur et interrupteur de branchement sur le secteur
6	A		C		6 Raccordements des fils de protection et compensation de potentiel
7			C		7 Détermination de la durée restante d'utilisation

Mechanische Bauteile					Ensembles mécaniques
8			C		8 Crochet (amorce de fissures, déformation à froid, usure)
9	A	B	C	88	9 Câble
10	A		C	94	10 Fixation du câble
11			C	96	11 Guide-câble
12			C		12 Pièces d'entraînement (engrenages, boudins, etc.)
13			C		13 Assemblages par vis, cordons de soudure
14	A		C	32, 33	14 Butées de fin de course, butoirs

Elektrische Bauteile					Ensembles électriques
15	A		C		15 Ligne d'alimentation électrique
16	A		C		16 Entrées de lignes
17			C		17 Collecteurs de courant
18	A		C		18 Fonctions de commutation



A B C	A B C	A B C	A B C
Erläuterungen siehe Seite 56	Explanations see page 56	Explications voir page 56	
*↑ Hinweise zu den Prüfungsarbeiten siehe Seite..			
*↑ Information on inspection work see page ..			
*↑ Pour remarques relatives aux travaux de contrôle, voir page ..			

Revisión y mantención del polipasto de cable

Inspeção e manutenção do diferencial de cabo

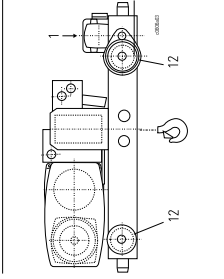
Verifiche e manutenzione del paranco

Controle en onderhoud van de staaldraadtakel

Tabla de control y de mantención					Tabela de inspeção e de manutenção	Tabella di verifica e di manutenzione	Controle-en onderhoudstabel
Dispositivos de seguridad					Dispositivos de segurança		
1	Freno				1 Freio	Dispositivi di sicurezza	1 Remmen
2	Interruptor fin de carrera de elevación				2 Interruptor de final de elevação	2 Finecorsa di sollevamento	2 Hijs-noodinrichtschakelaars
3	SETA DE EMERGENCIA, contactor principal				3 PARAGEM DE EMERGENCIA, chave do guindaste	3 EMERGENZA, marcia/arresto	3 NOODSTOP- en kraanschakelaars
4	Desconexión por sobrecarga				4 Limitador de sobrecarga	4 Dispositivo di sovraccarico	4 Overlastbegrenzers
5	Sectionador e interruptor principal				5 Interruptor de ligação à rede	5 Interruttore di rete	5 Scheidsings- en netschakelaars
6	Puestas a tierra y diferenciales				6 Terminais dos condutores de proteção e compensação de potencial.	6 Collegamento a terra ed equalizzatore di potenza	6 Veiligheidsleiding en spanningscompensatie
7	Cálculo la vida de servicio restante				7 Determinação da vida útil restante	7 Calcolo della rimanente durata di utilizzo	7 Bepaling van de resterende technische levensduur

Componentes mecánicos					Partes mecánicas	Componenti meccanici	Mechanische onderdelen
8	Gancho de carga (grietas incipientes, deformaciones, desgastes)				8 Gancho de cargas (fendias superficiales, deformação fria, desgaste).	8 Gancio di carico (inclinature, deformazioni a freddo, usura)	8 Lashaak (scheurtjes, koudvervorming, slijtage)
9	Cable				9 Cabo	9 Fune	9 Staaldraad
10	Sujeción del cable				10 Fixação do cabo	10 Attacco fune	10 Kabelbevestiging
11	Guía de cable				11 Guía-cabo	11 Guidafune	11 Draadgeleider
12	Piezas motrices, (dentado, pestañas, etc.)				12 Peças do accionamento (rodas dentadas, friso da roda, e cursos afins)	12 Organi della trasmissione (dentatura, corone)	12 Onderdelen van aandrijving (tandwielen, loopvlakken e.d.)
13	Uniones atomillados, soldaduras de soldadura				13 Uniãoes aparafusadas, cordões de soldadura.	13 Collegamenti a vite, cordoni di saldatura	13 Schroefverbindingen, lasnaden
14	Topes finales, amortiguadores de caucho				14 Batente final, amortecedor	14 Rispingenti, ammortizzatori	14 Eindanslagen, buffers

Componentes eléctricos					Partes eléctricas	Componenti elettrici	Elektrische onderdelen
15	Cable principal de alimentación				15 Cabo da alimentação	15 Cavo di alimentazione	15 Voedingsleidingen
16	Prensaestopas				16 Entradas das linhas	16 Passacavi	16 Leidingsdoorvoeren
17	Colectores de corriente				17 Escova colectora	17 Contatti striscianti	17 Aansluitingen
18	Funciones de conmutación				18 Funções dos interruptores	18 Funzioni di contatto ed interruzione	18 Schakelfuncties



A B C	A B C	A B C	A B C
Explicaciones véase pág. 57	Explicações ver pág. 57	Esposizioni vedi pag. 57	Verklaringen zie blz. 57
*↑ Para las advertencias referente a los trabajos de control, véase la página ..			
*↑ Indicações para as tarefas de inspeção, veja página ...			
*↑ Avvertenze riguardanti le verifiche da effettuare vedi pagina ...			

Prüf- und Wartungstabelle Inspection and maintenance table Tableau de contrôle et d'entretien

Pos.		X	Y	* ↑
20	Sicherheitseinrichtungen 20 Bremse prüfen	C		62
21	Überlastabschaltung, Federpaket und Führung fetten	C		80

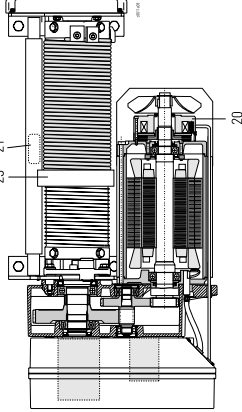
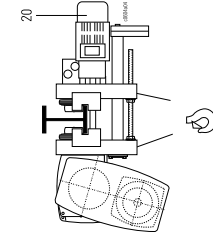
21 Système d'arrêt autom. en cas de sur-charge. - enduire de graisse paquet de ressorts et guidage

22	Mechanische Bauteile 22 Seil fetten	C	x3 b	118
23	23 Seilführung fetten	C	x3 b	118

22 Grease rope
23 Enduire de graisse le câble

24	Elektrische Bauteile 24 Klemmstellen für elektrische Leitungen nachziehen	C		
----	--	---	--	--

24 Retighten clamping points for electrical cables



C	Erläuterungen siehe Seite 60	C	Explications voir page 60
X	Art der Schmierung: x1= Tauchschmierung x2= Fettfüllung x3= mit Pinsel	X	Genre de lubrification : x1 = Lubrification par barbotage x2 = Garniture de graisse x3 = Au pinceau
Y	Schmierstelle, ↑ 118	Y	Pour point de lubrification, ↑ 118

* ↑ Hinweise zu den Wartungsarbeiten siehe Seite ..

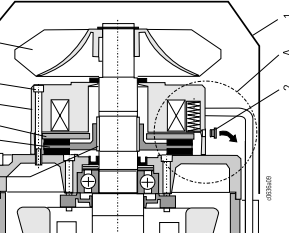
* ↑ Information on maintenance work see page ...

* ↑ Pour remarques relatives aux travaux d'entretien, voir page ..

Hubwerksbremse Hoist brake Frein du palan

• Sämtliche Arbeiten an der Hubwerksbremse nur am unbelasteten Seilzug und mit abgesetzter Hakenflasche vornehmen.

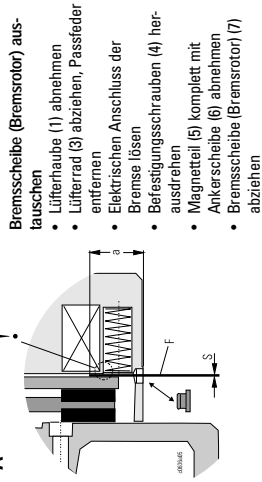
• N'exécuter tous les travaux que sur le palan sans charge, et la moufle reposant au sol.



Bremse prüfen
• Lüfterhaube (1) abnehmen
• Verschlussstopfen (2) entfernen
• Mit Führlehre (F) den Luftspalt (S) messen. Achtung! Beim Messen darauf achten, dass die Führlehre mindestens bis zur Eintauchtiefe "a" eingeschoben wird und nicht am Absatz (I) hängen bleibt.
Max. zulässiger Luftspalt (S) siehe Tabelle. Ist der max. zulässige Luftspalt (S) erreicht, muss die Bremsscheibe (Bremstorotor) ausgetauscht werden.

Checking brake
• Remove fan cover (1)
• Remove plug (2)
• Measure air gap (S) with feeler gauge (F). N.B.: When measuring, ensure that the feeler gauge is pushed in at least as far as depth "a" and does not catch on shoulder (I).
See table for max. permissible air gap (S). If the max. permissible air gap (S) has been reached, the brake disc (brake rotor) must be replaced.

Vérification du frein
• Déposer le capotage du ventilateur (1).
• Enlever le bouchon d'épissure (2).
• Avec une jauge d'épaisseur (F), mesurer l'entrefer (S). Attention ! Lors de la mesure, veiller à ce que la jauge d'épaisseur soit enfoncée au moins jusqu'à la profondeur de pénétration "a", et ne reste pas en butée contre le décrochement !
Pour l'entrefer max. admissible (S), voir tableau. Si l'entrefer max. admissible (S) est atteint, il faut remplacer le disque de frein (rotor de frein).



Replacing brake disc (brake rotor)
• Remove fan cover (1)
• Pull off fanwheel (3), remove feather key
• Disconnect brake ventilator (1)
• Unscrew fixing bolts (4)
• Remove magnet piece (5) together with armature disc (6)
• Remove brake disc (brake rotor) (7)
• Push new brake disc (brake rotor) (7) onto hub (8) and check radial play. If increased play is detected in the gearing between brake disc (7) and hub (8), the hub (8) must be removed from the motor shaft and replaced.
Please contact manufacturer before removing the hub (8).

Remplacement du disque de frein (rotor de frein)
• Déposer le capotage du ventilateur (1)
• Retirer la roue à ailettes du ventilateur (3), enlever la clavette
• Interrompre le branchement électrique du frein
• Enlever les vis de fixation (4)
• Retirer complètement le bloc magnétique (5) avec la bague d'induit (6)
• Enlever le disque de frein (rotor de frein) (7)
• Pousser le disque de frein neuf (rotor de frein) (7) sur le moyeu (8) et vérifier son jeu radial. Si le jeu a augmenté dans la denture entre le disque de frein (7) et le moyeu (8), il faut démonter le moyeu (8) de l'arbre du moteur et le remplacer.
Veuillez consulter le fabricant avant de déposer le moyeu (8).

Replace in reverse order. Take care that the check hole for measuring the air gap is in the lower section.

Pour l'assemblage, procéder dans l'ordre inverse. Veiller alors à ce que le trou de contrôle pour la mesure de l'entrefer se trouve en bas.

Replace in reverse order. Take care that the check hole for measuring the air gap is in the lower section.

Pour l'assemblage, procéder dans l'ordre inverse. Veiller alors à ce que le trou de contrôle pour la mesure de l'entrefer se trouve en bas.

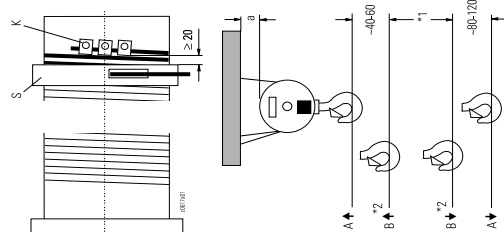
Den Zusammenbau in umgekehrter Reihenfolge vornehmen. Dabei darauf achten, dass die Kontrollbohrung für die Luftspaltmessung im unteren Bereich ist.

Pour l'assemblage, procéder dans l'ordre inverse. Veiller alors à ce que le trou de contrôle pour la mesure de l'entrefer se trouve en bas.

*1 Hubmotortyp
*2 Typ der Hubmotorbremse

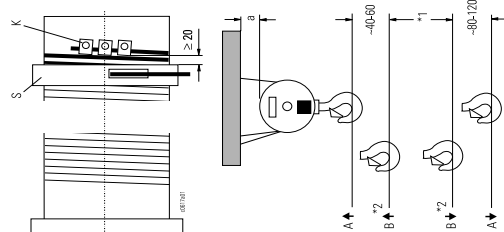
*1 Type de moteur de levage
*2 Type de frein du palan

2. Überbrückungstaste (U) am Steuergerät und gleichzeitig die „Auf“-taste drücken bis der **Notend- schalter** abschaltet (A†). Wenn der Seilzug nicht weiterfährt, wurde schon bei Schritt 1. vom Notendschalter abgeschaltet und der Betriebsendschalter funktioniert nicht.
3. Mindestabstand "a" siehe Tabelle.
4. "Ab"-Taste drücken und feste Hakenstellung in gleicher Weise kontrollieren.
5. Mindestabstand zwischen Seil- führungsring (S) und Klemmpratzen (K) für die Seilbefestigung = 20 mm, siehe Skizze; ansonsten den End- schalter neu einstellen.
- Die Abstände der Schaltpunkte zwischen Betriebs- und Notend- schalter sind auf normale Betriebs- bedingungen abgestimmt, sie könn- nen jedoch bei Bedarf verändert werden.
 - Les intervalles des points de com- mutation entre interrupteur de fin de course utile et interrupteur d'urgence en fin de course sont réglés pour des conditions norma- les de fonctionnement, mais il est possible de les modifier en cas de besoin.
2. Press override button (U) on control pendant and at the same time the "up" button until the **emergency limit switch** switches off (A†). If the hoist does not continue to move, the emergency limit switch was activated in step 1 and the operational limit switch is not working.
3. Minimum clearance "a" see table.
4. Press "**down**" button and check bottom hook position in the same way.
5. Minimum clearance between rope guide (S) and clamping claws (K) for rope anchorage = 20 mm, see sketch, if this is not observed, reset limit switch.
- The distance between the switching points for operational and emergency limit switch is adjusted to normal operating conditions, however they can be adjusted if necessary.
 - Les intervalles des points de com- mutation entre interrupteur de fin de course utile et interrupteur d'urgence en fin de course sont réglés pour des conditions normales de fonctionnement, mais il est possible de les modifier en cas de besoin.



	a [mm]	
	50 Hz	60 Hz
1/1	130	150
2/2-1	70	80
4/2-1	40	50
4/1		

- déconnecte quand le crochet est à sa position la plus élevée en fonctionnement normal (B†).
2. Actionner la touche de commande, et appuyer simultanément sur la touche "Montée" jusqu'à ce que l'**interrupteur d'urgence en fin de course** déconnecte (A†). Si le palan reste immobile, c'est que l'interrupteur d'urgence en fin de course a déjà déconnecté au stade 1, et que l'interrupteur de fin de course utile ne fonctionne pas.
3. Pour l'intervalle minimal "a", voir tableau.
4. Actionner la **toucher "Descende"** et contrôler de la même façon la position la plus basse du crochet.
5. Pour l'intervalle minimal entre bague guide-câble (S) et pattes de serrage (K) de la fixation du câble = 20 mm, voir croquis, sinon régler de nouveau l'interrupteur de fin de course.
- Les intervalles des points de com- mutation entre interrupteur de fin de course utile et interrupteur d'urgence en fin de course sont réglés pour des conditions norma- les de fonctionnement, mais il est possible de les modifier en cas de besoin.



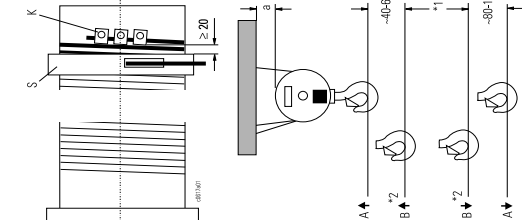
	a [mm]	
	50 Hz	60 Hz
1/1	130	150
2/1	70	80
4/2-1	40	50
4/1		

Endschalter einstellen

Zur Kontakteinstellung muss die Haut- be des Endschalters entfernt werden. Dadurch werden spannungsführende Kontakte freigelegt. Es be- steht daher die Gefahr der Berührung unter Spannung stehender Teile!

Der Endschalter kann an den Stell- schrauben (S1) - (S4) bzw. (S1) - (S8), eingestellt werden:
Linksdrrehung: Schaltpunkt wird nach "unten" versetzt,
Rechtsdrrehung: Schaltpunkt wird nach "oben" versetzt.
Einstellung mit Schraubendreher und ohne unnötig große Kräfteinwirkung vornehmen. Keinen Elektroschrauber o.ä. benutzen.

Blockverstellung
Mit der schwarzen Stellschraube (S0) können alle Nockenschrauben gemein- sam verstellt werden. Dabei bleibt die relative Einstellung der Einzelkontakte unverändert.
• Schaltpunkte in folgender Reihen- folge einstellen:



Steuerung mit einem Umschalterschütz

Notendschalter:

- 1. A† (S2)
- 2. A‡ (S1)

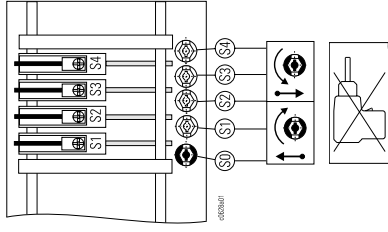
Kombinierten Betriebs- und

Notendschalter:

- 1. A† (S2)
- 2. B† (S4)
- 3. A‡ (S1)
- 4. B‡ (S3)

Schaltpunkt A† (S2)

"Notendschalter höchste Haken- stellung"
• Heben der Hakenflasche 2/1 bis a+10 mm bzw. bei 4/1 bis a+5 mm, (Skizze, Tabelle) Stellschraube (S2) ggf. vorher nach rechts drehen
• Stellschraube (S2) nach links drehen, bis der Schaltkontakt S2 hör- bar schaltet
• Abschaltpunkt in Haupthub und Feinhub kontrollieren.

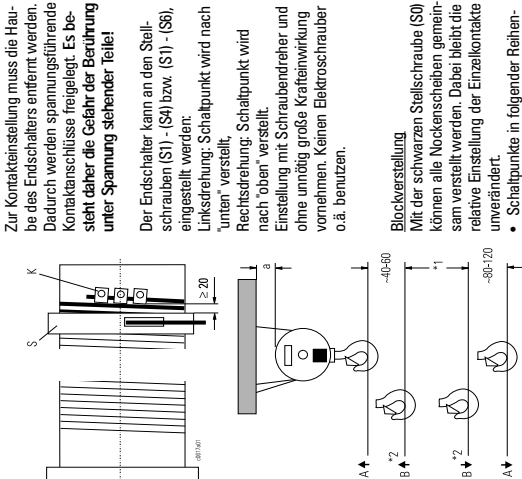


Adjusting limit switch

In order to set the contacts, the cover of the limit switch must be removed. This exposes live contact connections. There is thus a danger of contact with live parts!

The limit switch can be adjusted at the setscrews (S1)-(S4),
(S1)-(S8):
Turning to the left: switching point is moved "downwards",
Turning to the right: switching point is moved "upwards".
Set switching points using a screwdriver and without exerting excessive force. Do not use a power screwdriver or similar.

Adjusting en bloc
All the cam discs can be moved together with the aid of the black setscrew (S0). The settings of the individual contacts relative to one another remain unchanged.
• Adjust the switching points in the following sequence:



Controls with one changeover contactor

Emergency limit switch:

- 1. A† (S2)
- 2. A‡ (S1)

Combined operational and emergency limit switch:

- 1. A† (S2)
- 2. B† (S4)
- 3. A‡ (S1)
- 4. B‡ (S3)

Switching point A† (S2)

"Interrupteur d'urgence en fin de course, position supérieure extrême du crochet"
• Lift bottom hook block 2/1 to a+10 mm or to a+5 mm for 4/1 (sketch, table). If necessary turn setscrew (S2) to the right before hand.
• Turn setscrew (S2) to the left until contact S2 switches audibly.
• Check switching-off point in main and micro hoist

Commande par un seul contacteur de commutation

Interrupteur d'urgence en fin de course

- 1. A† (S2)
- 2. A‡ (S1)

Interrupteur combiné de fin de course utile et d'urgence

- 1. A† (S2)
- 2. B† (S4)
- 3. A‡ (S1)
- 4. B‡ (S3)

Point de commutation A† (S2)

"Interrupteur d'urgence en fin de course, position supérieure extrême du crochet"
• Lever la moufle 2/1 jusqu'à a + 10 mm ou, avec 4/1, jusqu'à a + 5 mm (croquis, tableau), le cas échéant tourner préalablement vers la droite la vis de réglage (S2).
• Tourner la vis de réglage (S2) vers la gauche jusqu'à ce que le bruit de commutation du contact S2 soit perceptible.
• Contrôler le point de déconnexion en levage normal et en levage très lent.

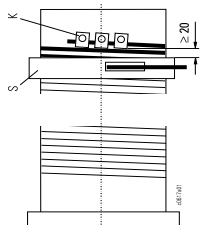
*1 Course utile du crochet avec interrupteur de fin de course utile
*2 Option

Seilzug prüfen und warten

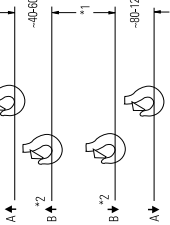
Inspecting and servicing wire rope hoist

Contrôle et entretien du palan

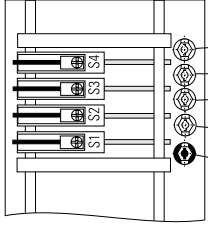
Schaltpunkt B1 (S4)
"Betriebsentschalter höchste Hakenstellung"
(Minimaler Abstand zu A1 bei 2/1 60 mm, bei 4/1 40 mm)
• Heben der Hakenfläsche 2/1 bis 10 mm bzw. bei 4/1, bis 5 mm vor den gewünschten Abschaltpunkt. Stellschraube (S4) ggf. vorher nach rechts drehen
• Stellschraube (S4) nach links drehen, bis der Schaltkontakt S4 hörbar schaltet
• Abschaltpunkt in Haupthub und Feinhub kontrollieren.



Schaltpunkt A1 (S1)
"Notenschalter tiefste Hakenstellung"
(Mindestabstand zwischen Seilführung (S) und Klemmpratzen (K) für die Selbstfestigung = 20 mm, siehe Skizze)
Tiefste Hakenstellung so einstellen, dass die Hakenfläsche nicht auf dem Boden aufsetzt (Schlafsilberbildung).
• Senken der Hakenfläsche 2/1 bis 120 mm bzw. bei 4/1 bis 60 mm, vor die gewünschte Hakenstellung, Stellschraube (S1) ggf. vorher nach links drehen
• Stellschraube (S1) nach rechts drehen, bis der Schaltkontakt S1 hörbar schaltet
• Abschaltpunkt in Haupthub und Feinhub kontrollieren.



	a [mm]	
	50 Hz	60 Hz
1/1	130	150
2/2-1	70	80
4/2-1	40	50



Schaltpunkt B1 (S3)
"Betriebsentschalter tiefste Hakenstellung"
(Minimaler Abstand zu A1 bei 2/1 120 mm, bei 4/1 80 mm)
• Senken der Hakenfläsche 2/1 bis 120 mm bzw. bei 4/1 bis 60 mm, vor die gewünschte Hakenstellung, Stellschraube (S3) ggf. vorher nach links drehen
• Stellschraube (S3) nach rechts drehen, bis der Schaltkontakt S3 hörbar schaltet
• Abschaltpunkt in Haupthub und Feinhub kontrollieren.

Switching point B1 (S3)
"Operational limit switch bottom hook position"
(Minimum clearance to A1 120 mm for 2/1, 80 mm for 4/1)
• Lower bottom hook block 2/1 to 120 mm, or 60 mm for 4/1, above desired hook position, if necessary turn setscrew (S3) to the left beforehand
• Turn setscrew (S3) to the right until contact S3 switches audibly
• Check switching-off point in main and micro hoist.

Point de commutation B1 (S4)
"Interrupteur de fin de course utile, position supérieure extrême du crochet"
(Écartement minimal par rapport à A1 avec 2/1 : 60 mm ; avec 4/1 : 40 mm)
• Lever la moufle 2/1 jusqu'à 10 mm ou, avec 4/1, jusqu'à 5 mm avant le point de déconnexion souhaité ; le cas échéant, tourner préalablement vers la droite la vis de réglage (S4)
• Tourner la vis de réglage (S4) vers la gauche jusqu'à ce que le bruit de commutation du contact S4 soit perceptible.
• Contrôler le point de déconnexion en levage normal et en levage très lent.

Point de commutation A1 (S1)
"Interrupteur d'urgence en fin de course, position inférieure extrême du crochet"
(Écartement minimal entre bague guide (S) et pattes de serrage (K) de la fixation du câble = 20 mm, voir croquis)
Régler la position inférieure extrême du crochet de sorte que la moufle ne repose pas sur le sol (apparition de mou du câble).
• Baisser la moufle 2/1 jusqu'à 120 mm ou, avec 4/1, jusqu'à 60 mm avant la position souhaitée du crochet ; le cas échéant, tourner préalablement vers la gauche la vis de réglage (S1).
• Tourner la vis de réglage (S1) vers la droite jusqu'à ce que le bruit de commutation du contact S1 soit perceptible.
• Contrôler le point de déconnexion en levage normal et en levage très lent.

Point de commutation B1 (S3)
"Interrupteur de fin de course utile, position inférieure extrême du crochet"
(Écartement minimal par rapport à A1 avec 2/1 : 120 mm ; avec 4/1 : 80 mm)
• Baisser la moufle 2/1 jusqu'à 120 mm ou, avec 4/1, jusqu'à 60 mm avant la position souhaitée du crochet ; le cas échéant, tourner préalablement vers la gauche la vis de réglage (S3).
• Tourner la vis de réglage (S3) vers la droite jusqu'à ce que le bruit de commutation du contact S3 soit perceptible.
• Contrôler le point de déconnexion en levage normal et en levage très lent.

*1 Usable hook path with operational limit switch
*2 Option

*1 Course utile du crochet avec interrupteur de fin de course utile
*2 Option

Seilzug prüfen und warten

Inspecting and servicing wire rope hoist

Contrôle et entretien du palan

Beidseitige Steuerung mit zwei getrennten Umschalterschützen
(alle Anschlüsse sind auf eine Sammelleiste geleitet)

Notenschalter:

- 1. A1 (S2) Haupthub (S4) Feinhub
- 2. A1 (S1) Haupthub (S3) Feinhub

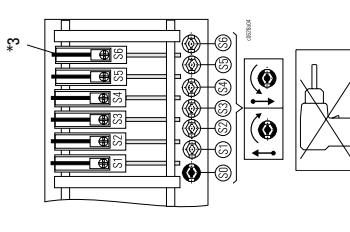
Kombinierten Betriebs- und Notenschalter (in Verbindung mit Überlastabschaltung SLM1, SMC1):

- 1. A1 (S2) Haupthub (S4) Feinhub
- 2. B1 (S6) (S4) Feinhub
- 3. A1 (S1) Haupthub (S3) Feinhub
- 4. B1 (S5) (S3) Feinhub

Schaltpunkt A1 (S2) Haupthub + (S4) Feinhub
"Notenschalter höchste Hakenstellung"
• Heben der Hakenfläsche 2/1 bis 120 mm bzw. bei 4/1 bis 60 mm, vor die gewünschte Hakenstellung, Stellschraube (S2) ggf. vorher nach rechts drehen
• Stellschraube (S2) bzw. (S4) nach links drehen, bis der Schaltkontakt S2 bzw. S4 hörbar schaltet
• Abschaltpunkt in Haupthub und Feinhub kontrollieren.

	a [mm]	
	50 Hz	60 Hz
1/1	130	150
2/2-1	70	80
4/2-1	40	50

Schaltpunkt B1 (S6)
"Betriebsentschalter höchste Hakenstellung"
(Minimaler Abstand zu A1 bei 2/1 60 mm, bei 4/1 40 mm)
• Heben der Hakenfläsche 2/1 bis 10 mm bzw. bei 4/1 bis 5 mm vor den gewünschten Abschaltpunkt, Stellschraube (S6) ggf. vorher nach rechts drehen
• Stellschraube (S6) nach links drehen, bis der Schaltkontakt S6 hörbar schaltet
• Abschaltpunkt in Haupthub und Feinhub kontrollieren.



Controls by customer with two separate changeover contactors
(all connections are collected on a terminal strip)

Emergency limit switch:

- 1. A1 (S2) main hoist (S4) micro hoist
- 2. A1 (S1) main hoist (S3) micro hoist

Combined operational and emergency limit switch:
(in conjunction with overload cut-off SLM1, SMC1):

- 1. A1 (S2) main hoist (S4) micro hoist
- 2. B1 (S6) (S4) micro hoist
- 3. A1 (S1) main hoist (S3) micro hoist
- 4. B1 (S5) (S3) micro hoist

Switching point A1 (S2) + (S4)
"Emergency limit switch top hook position"
• Lift bottom hook block 2/1 to a+10 mm, or a+5 mm for 4/1 (sketch, table), if necessary turn setscrews (S2) and (S4) to the right beforehand
• Turn setscrews (S2) and (S4) to the left until contacts S2 and S4 switch audibly
• Check switching-off point in main and micro hoist

Switching point B1 (S6)
"Operational limit switch top hook position"
(Minimum clearance to A1 60 mm for 2/1, 40 mm for 4/1)
• Lift bottom hook block 2/1 to 10 mm, 4/1 to 5 mm, below the desired switching-off point, if necessary turn setscrews (S6) to the right beforehand
• Turn setscrews (S6) to the left until contacts S6 switch audibly
• Check switching off point in main and micro hoist

Point de commutation B1 (S6)
"Interrupteur de fin de course utile, position supérieure extrême du crochet"
(Écartement minimal par rapport à A1 avec 2/1 : 60 mm ; avec 4/1 : 40 mm)
• Lever la moufle 2/1 jusqu'à 10 mm ou, avec 4/1, jusqu'à 5 mm avant le point de déconnexion souhaité ; le cas échéant, tourner préalablement vers la droite la vis de réglage (S6).
• Tourner les vis de réglage (S6) vers la gauche jusqu'à ce que le bruit de commutation des contacts S6 soit perceptible.
• Contrôler le point de déconnexion en levage normal et en levage très lent.

*1 Usable hook path with operational limit switch
*2 Option
*3 Depending on version, there are 2, 4 or 6 switching elements

*1 Course utile du crochet avec interrupteur de fin de course utile
*2 Option
*3 Selon l'exécution, il y a 2, 4 ou 6 éléments de commutation

Seilzug prüfen und warten

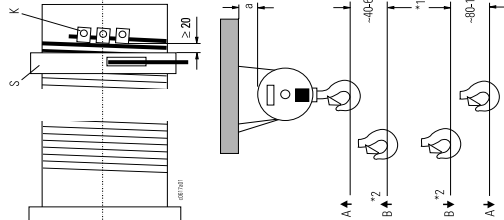
Inspecting and servicing

Controlle et entretien du

wire rope hoist

palan

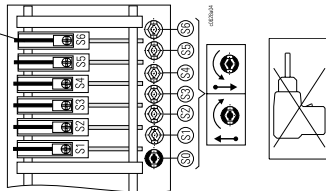
Schaltpunkt A↓ (S1) Haupthub
±(S3) Feinhub
"Notendenschalter tiefste Haken-
stellung"
(Mindestabstand zwischen Seil-
führungsring (S) und Klemmpratzen
(K) für die Seilbefestigung = 20 mm,
siehe Skizze)
Tiefste Hakenstellung so einstellen,
dass die Hakenflasche nicht auf
dem Boden aufsetzt (Schleifseil-
bildung).
• Senken der Hakenflasche 2/1 bis
120 mm bzw. bei 4/1 bis 60 mm,
vor die gewünschte Haken-
stellung. Stellschraube (S1) bzw.
(S3) ggf. vorher nach links dre-
hen
• Stellschraube (S1) bzw. (S3) nach
rechts drehen, bis der Schalt-
kontakt S1 bzw. S3 hörbar schal-
tet
• Abschaltpunkt in Haupthub und
Feinhub kontrollieren.



Schaltpunkt B↓ (S5)
"Betriebsendenschalter tiefste Haken-
stellung"
(Minimaler Abstand zu A↓ bei 2/1
120 mm, bei 4/1 80 mm)
• Senken der Hakenflasche 2/1 bis
120 mm bzw. bei 4/1 bis 60 mm,
vor die gewünschte Haken-
stellung. Stellschraube (S5) ggf.
vorher nach links drehen
• Stellschraube (S5) nach rechts
drehen, bis der Schaltkontakt S5
hörbar schaltet
• Abschaltpunkt in Haupthub und
Feinhub kontrollieren.

	a [mm]	
	50 Hz	60 Hz
1/1	130	150
2/2-1	70	80
4/2-1	40	50

*3



Sicherheitshinweis:
Nicht korrekt eingestellte
Endschalter können zu schweren
Unfällen führen!

Safety note:
Incorrectly set limit switches can
cause serious accidents!

Consigne de sécurité
Les fins de course qui ne sont pas
réglées correctement peuvent
provoquer des accidents graves !

*1 Nutzbarer Hakenweg mit
Betriebsendenschalter
*2 Option
*3 Je nach Ausführung sind 2, 4 oder
6 Schaltelemente vorhanden.

*1 Usable hook path with operational
limit switch
*2 Option
*3 Depending on version, there are 2,
4 or 6 switching elements

*1 Course utile du crochet avec
interrupteur de fin de course utile
*2 Option
*3 Selon l'exécution, il y a 2, 4 ou 6
éléments de commutation

Seilzug prüfen und warten

Inspecting and servicing

Controlle et entretien du

wire rope hoist

palan

Point de commutation A↓ (S1) +
(S3)
"Interrupteur d'urgence en fin de
course, position inférieure extrême du
crochet"
(Écartement minimal entre bague
guide-câble (S) et pattes de serrage
(K) de la fixation du câble = 20 mm,
voir croquis)
Régler la position inférieure extrême
du crochet de sorte que la moufle ne
repose pas sur le sol (apparition de
mou du câble).
• Baisser la moufle 2/1 jusqu'à 120
mm ou, avec 4/1, jusqu'à 60 mm
avant la position souhaitée du
crochet; le cas échéant, tourner
préalablement vers la gauche les
vis de réglage (S1) et (S3)
• Tourner les vis de réglage (S1) et
(S3) vers la droite jusqu'à ce que le
bruit de commutation du contact
S1 ou S3 soit perceptible.
• Contrôler le point de déconnexion
en levage normal et en levage très
lent.

Point de commutation B↓ (S5)
"Interrupteur de fin de course utile,
position inférieure extrême du
crochet"
(Écartement minimal par rapport à
A↓ avec 2/1 : 120 mm ; avec 4/1 :
80 mm)
• Baisser la moufle 2/1 jusqu'à 120
mm ou, avec 4/1, jusqu'à 60 mm
avant la position souhaitée du
crochet; le cas échéant, tourner
préalablement vers la gauche les
vis de réglage (S5) et (S7).
• Tourner les vis de réglage (S5) et
(S7) vers la droite jusqu'à ce que le
bruit de commutation des contacts
S5 et S7 soit perceptible.
• Contrôler le point de déconnexion
en levage normal et en levage très
lent.

Consigne de sécurité
Les fins de course qui ne sont pas
réglées correctement peuvent
provoquer des accidents graves !

*1 Course utile du crochet avec
interrupteur de fin de course utile
*2 Option
*3 Selon l'exécution, il y a 2, 4 ou 6
éléments de commutation

Endschalter warten
Geräteendenschalter
Die Wartungsarbeiten beschränken
sich auf die Überprüfung der Ab-
schaltpunkte. Am Getriebeend-
schalter selbst sind keine
Wartungs- und Inspektionsarbeiten
erforderlich.
Staubablagerungen bei geöffnetem
Gehäuse dürfen auf keinen Fall mit
Pressluft entfernt werden, da der
Staub dadurch erst recht in die
Kontakte eindringen und das
Schaltvermögen beeinträchtigen
kann.
Auf keinen Fall darf für die Reini-
gung des Endschalters Benzin oder
andere Lösungsmittel verwendet
werden!
Nach dem Öffnen nach längerer
Betriebszeit ist die Haubendichtung
zu erneuern.
Maintenance of limit switch
Gear-type limit switch
Maintenance work is restricted to
checking the switching-off points.
No maintenance or inspection is
necessary for the gear-type limit
switch itself.
Any dust deposits visible when the
housing is opened must on no ac-
count be removed with compressed
air as this would force the dust into
the contacts and impair the
switching function.
On no account must benzene or
other solvents be used to clean the
limit switch!
If the housing is opened after
considerable time in operation, the
gasket in the lid should be replaced.
Enlèvement des dépôts de poussière
tandis que le boîtier est ouvert,
car la poussière peut alors
pénétrer dans les contacts et
compromettre le pouvoir de
coupure.
Pour le nettoyage de l'intérieur-
teur de fin de course, n'utiliser, en
aucun cas, de l'essence ou
d'autres solvants !
Si, après quelque temps de
fonctionnement, le carter est
ouvert, il faut renouveler la
garniture du capotage.

Seilzug prüfen und warten

Inspecting and servicing

Controlle et entretien du

wire rope hoist

palan

Überlastabschaltung SLM1 prüfen

Bei erkannter Überlast wird der Seilzug in der Aufwärtsbewegung abgeschaltet. Anschließend ist nur noch Senken möglich. Heben ist erst wieder möglich, wenn der Seilzug entlastet wurde.

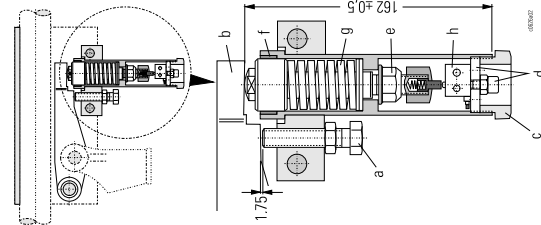
- Nennlast + 20% Überlast anhängen und langsam die Last aufnehmen. Nach dem Straffen des Seiles muss die Überlastabschaltung abschalten.

Überlastabschaltung SLM1 warten

- Federbolzenführung (f) säubern, überprüfen und nachschmieren. Die Feder (g) ist mit der Mutter (e) vorgespannt. Diese Einstellung darf nicht verändert werden!
- Die Stellung der Einstellschraube (d) darf ebenfalls nicht verändert werden.

Sollte wegen sehr starker Verschmutzung eine Zerlegung erforderlich werden, ist die Feder (g) beim Zusammenbau wieder auf das Maß $162 \pm 0,5$ vorzuspannen.

Anschließend muss die Überlastabschaltung neu eingestellt werden.



Überlastabschaltung SLM1 einstellen

- Anschlagschraube (a) im belasteten Zustand (110%) bis zur Bolzenführung mit Hebel (b) einschrauben.
- Anschlagschraube (a) um 1 Umdrehung (1,75 mm) zurückdrehen und mit Mutter kontern.
- Schraube (c) lösen.
- Überlastabschaltung mit Einstellschraube (d) so einstellen, dass bei 20% Überlast abgeschaltet wird. Eine Kontrolle der Einstellung ist mittels der LED "load" am SLM1 möglich. Leuchtet sie, hat der Mikroschalter (h) noch nicht geöffnet. Bei angehängter Überlast muss mit (d) so eingestellt werden, dass die LED "load" gerade erlischt. (Linksrehnung = höhere Last, Rechtsdrehung = kleinere Last).
- Position der Einstellschraube (d) markieren und mit Sicherungslack sichern.
- Schraube (d) mit Schraube (c) kontern.

Testing overload cut-off SLM1

If an overload is detected, the wire rope hoist is switched off in the upwards direction. Only lowering is possible. Lifting is not possible until the wire rope hoist has been unloaded.

- Attach nominal load +20% overload and take load up slowly. After the rope has been tautened the overload cut-off must be activated.

Maintenance of overload cut-off SLM1

- Clean, check and grease spring bolt guide (f). The spring (g) is pretensioned with the nut (e). **This setting must not be altered!**
- The setting of adjusting screw (d) must not be altered either.

If dismantling is necessary due to excessive deposits of dirt, the spring (g) must be pretensioned to dimension $162 \pm 0,5$ before refitting.

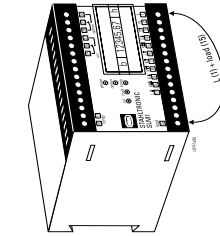
The overload cut-off must then be reset.

Adjusting overload cut-off SLM1

- Screw down stop screw (a) under load (110%) until it touches lever (b).
 - Unscrew stop screw (a) by 1 turn (1,75 mm) and lock with nut.
 - Unscrew bolt (c).
 - Adjust overload cut-off with adjusting screw (d) so that it switches off at 20% overload.
- The setting can be checked by means of the LED "load" on the SLM1. If it is illuminated, the microswitch (h) has not opened yet. It must be adjusted with (d) under overload so that the LED "load" is just extinguished. (Turning to the left = greater load, Turning to the right = smaller load).
- Mark the position of adjusting screw (d) and secure with lacquer.
- Lock screw (d) with bolt (c).
 - Set time for bypassing load oscillations on evaluation device SLM1 with a HEX switch (range of adjustment 0.25 ... 1 sec.) if the

- Die Zeit zum Überbrücken der Lastschwingungen mit einem HEX-Schalter am Auswertegerät SLM1 einstellen (Einstellbereich 0,25 ... 1 Sek.). Ist der Mikroschalter (h) unterbrochen länger geöffnet als diese Zeit, erfolgt die Abschaltung. Diese Zeit für eine schnelle Abschaltung möglichst kurz einstellen.
- Abschaltung überprüfen.

Kranprüfung



Um bei der Abnahme der Kranbrücke die Prüflast von 125% anheben zu können, muss die Überlastabschaltung außer Kraft gesetzt werden.

Dies geschieht am einfachsten durch eine Brücke zwischen L (I) und load (15). Damit wird der Mikroschalter -F272 überbrückt und die Last kann angehoben werden.

Crane test

In order to be able to lift the test load of 125% for the crane bridge acceptance test, the overload cut-off must be put out of action.

The simplest way to do this is with a jumper between L (I) and load (15). This bridges the microswitch -F272 and the load can be lifted.

Contrôle du pont roulant

Pour qu'il soit possible de soulever la charge d'épreuve du pont roulant de 125 % lors de la réception, le système d'arrêt automatique en cas de surcharge doit être mis hors service.

La façon la plus simple d'y procéder est de ponter L (I) et load (15). Cela provoque le pontage de l'interrupteur miniature -F272, et la charge peut être soulevée.



In diesem Fall gibt es keine Begrenzung der Last mehr, es können auch sehr große Lasten angehoben werden. Unfallgefahr!

Nach der Kranprüfung diese Brücke unbedingt entfernen.

In this case, there is no longer any limiting of the load, extremely heavy loads can be lifted. Risk of accidents!

Do not fail to remove this jumper after the crane test.

Dans ce cas, il n'y a plus de limitation de la charge. Il peut même être soulevé de très fortes charges. Risque d'accident !

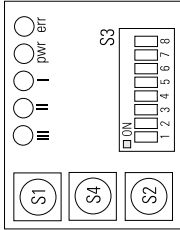
Après contrôle du pont roulant, il faut absolument supprimer ce pont.

- Blockier la vis (d) au moyen de la vis (c).
- Régler avec un interrupteur HEX sur l'analyseur SLM1, le temps de compensation des oscillations de la charge (gamme de réglage 0,25 ... 1 s). Si l'interrupteur miniature (h) reste ouvert sans interruption pendant une durée plus longue, la déconnexion a lieu. Régler le plus court possible ce temps de déconnexion rapide.
- Contrôler la déconnexion.

microswitch (h) is continuously open for longer than this period it is switched off. Set this time as short as possible to ensure a speedy cut-off.

- Check cut-off.





Überlastabschaltung SLE1
Die Einstellung der Überlastabschaltung SLE1 mit dem Sensor LHB wird komplett im Werk vorgenommen und darf nicht verändert werden.
Unter der Frontplatte des Auswertegerätes (Skizze) sind die Werkseinstellungen notiert.

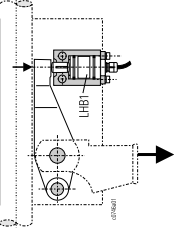
Overload cut-off SLE1
The overload cut-off SLE1 and sensor LHB are set in the works; this setting must not be altered. The works settings are shown in a sketch under the front cover of the evaluation device.

Systèmes d'arrêt automatique en cas de surcharge SLE1
Le réglage du système d'arrêt automatique en cas de surcharge SLE1 avec le capteur LHB est effectué complètement en usine et ne doit pas être modifié.
Sous la platine frontale de l'analyseur (croquis) figurent les réglages effectués en usine.

Überlastabschaltung SLE1 prüfen
Bei erkannter Überlast wird der Seilzug in der Aufwärtsbewegung abgeschaltet. Anschließend ist nur noch Senken möglich. Heben ist erst wieder möglich, wenn der Seilzug entlastet wurde.
• Nennlast + 10% Überlast anhängen und langsam die Last aufnehmen. Nach dem Straffen des Seiles muss die Überlastabschaltung abschalten.

Testing overload cut-off SLE1
If an overload is detected, the wire rope hoist is switched off in the upwards direction. Only lowering is then possible. Lifting is not possible until the wire rope hoist has been unloaded.
• Attach nominal load +10% overload and take load up slowly. After the rope has been tautened the overload cut-off must be activated.

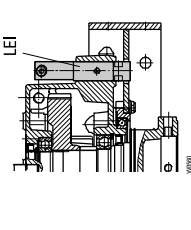
Contrôle du système d'arrêt automatique en cas de surcharge SLE1
S'il est constaté une surcharge, le palan est déconnecté dans son mouvement ascendant. Puis seul le mouvement de descente est possible.
Le levage n'est de nouveau possible qu'une fois que le palan a été sans charge.
• Eléver la charge nominale +10% de surcharge et lever la charge. Une fois le câble tendu, le système d'arrêt automatique en cas de surcharge doit être déconnecter.



Überlastabschaltung SLE1 warten
• Federbolzenführung säubern, überprüfen und nachschmieren.

Maintenance of overload cut-off SLE1
• Clean, check and grease spring bolt guide.

Entretien du système d'arrêt automatique en cas de surcharge SLE1
• Nettoyer, vérifier et lubrifier le guidage de l'axe du ressort.



Überlastabschaltung LEI-SLE1 warten

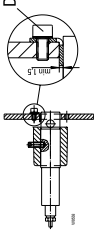
Maintenance of overload cut-off LEI-SLE1

Entretien du système d'arrêt automatique en cas de surcharge LEI-SLE1

Blechstärke überprüfen (min. 1,5mm). Auflageblech ggf. nach lösen der Schraube (D) ersetzen.

Check thickness of plate (min. 1.5 mm). If necessary, replace plate after unscrewing screw (D).

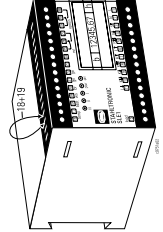
Vérifier l'épaisseur de la tôle (1,5 mm au minimum). Si nécessaire, remplacer la tôle après avoir desserré la vis (D).



Kranprüfung

Um bei der Abnahme der Kranbrücke die Prüflast von 125% anheben zu können, muss die Überlastabschaltung außer Kraft gesetzt werden.

Mit einer Brücke zwischen Klemme 18 und Klemme 19 wird der Modus Kranprüfung des Lastwächters aktiviert.
Der Grenzwert wird auf das 1,25-fache der eingestellten Abschalt-schwelle (S4, S2) angehoben und die LED "err" blinkt zur Anzeige.



In diesem Fall gibt es keine Begrenzung der Last mehr, es können auch sehr große Lasten angehoben werden. Unfallgefahr!
Nach der Kranprüfung diese Brücke unbedingt entfernen.

In this case, there is no longer any limiting of the load, extremely heavy loads can be lifted. Risk of accidents!
Do not fail to remove this jumper after the crane test.

Dans ce, il n'y a plus de limitation de la charge. Il peut même être soulevé de très fortes charges. Risque d'accident !
Après contrôle du pont roulant, il faut absolument supprimer ce pont.

Crane test

In order to be able to lift the test load of 125% for the crane bridge acceptance test, the overload cut-off must be put out of action.

The crane test mode of the load monitor is activated by a jumper between terminal 18 and terminal 19.
The limit value is raised to 1.25 times the cut-off threshold set (S4, S2) and is indicated by the LED "err" blinking.

Contrôle du pont roulant

Pour qu'il soit possible de lever la charge d'épreuve du pont roulant de 125 % lors de la réception, le système d'arrêt automatique en cas de surcharge doit être mis hors service.

Un pontage des bornes 18 et 19 active le mode Contrôle du pont roulant du contrôleur de charge. La valeur limite est réglée sur 1.25 fois le seuil de déconnexion réglé (S4, S2), et la DEL «err» clignote pour le signaler.

Seiltrieb

Seil und Seilbefestigung
Nach Inbetriebnahme eines neuen Seilzuges oder nach einem Seilwechsel kann bei mehrsträngigen Seilzügen ein Drall im Drahtseil entstehen. Dies zeigt sich durch Drehen der Hakenflasche, insbesondere im unbelasteten Zustand. Ein Drall im Seil beeinträchtigt die Sicherheit und Haltbarkeit.

Beseitigen Sie deshalb jeden Drall!

- Seil immer wieder auf einen Drall hin überprüfen. Dazu ohne Last in höchste und tiefste Hakenstellung fahren.
- Ist ein Drall zu erkennen, Seil sofort entdrallen, ↑ 44, "Seil einscheren" und ↑ 94, "Seil ablegen".
- Seil prüfen. Besonders auf die Seilpartien im Bereich der Seilumlenk- oder Ausgleichsrollen und des Seilfestpunktes achten.
- Tritt einer der nachstehenden Schäden auf, das Seil sofort erneuern:

1. Überschreiten der sichtbaren Drahtbrüche, ↑ 92, Tabelle. Zur Prüfung muß das Seil entlastet sein, um durch Biegen des Seiles von Hand ungefähr Seilrollenradius vorhandene Drahtbrüche besser erkennen zu können.
2. Drahtbruchnest oder gebrochene Litze.
3. durch Korrosion oder Abrieb um 10% verminderten Durchmesser (auch ohne Bruch).
4. Verminderung des Seildurchmessers durch Strukturveränderungen auf längeren Strecken.
5. Korb- und Schlaufenbildung, Knoten, Einschnürung, Knick, oder sonstigen mechanischen Beschädigungen.
6. Korkenzieherartige Verformung. Verformungsabweichung: $\geq 1/3 \times \text{Seildurchmesser}$.
7. Ferner muss das Seil entsprechend den Vorgaben in der DIN 15020, FEM 9.661 und ISO 4309 abgelegt werden.
8. Bei bestimmten Anwendungen (z.B. drehungsfreies Seil, ständige Totlast, immer wiederkehrende Halteposition, Automatabtrieb etc.) können Drahtbrüche im Inneren des Seiles entstehen, welche von außen nicht sichtbar sind.

Rope drive

Rope and rope attachment
After commissioning a new wire rope hoist, or after replacing the rope, twisting may occur in the rope of multi-fall hoists. This can be seen from the bottom hook block turning, particularly when unloaded. Twisting in the rope prejudices safety and service life. **Remove any twists!**

- Regularly inspect the rope for twisting. For this, run the hoist into highest and lowest hook positions without load.
- If twisting is detected, untwist the rope immediately. ↑ 44, "Reeving rope" and ↑ 94, "Removing rope".
- Check rope. Take particular note of the sections of rope near rope pulleys, return pulleys or equalizing pulleys and in the region of the rope anchorage.
- If any of the following damage occurs, replace the rope immediately.

1. Excess visible wire fractures, ↑ 92, table. The rope must be free of load when being checked to facilitate the detection of any wire fractures when bending the rope by hand (approximately by radius of rope sheave).
2. Nest of wire fractures or broken strand.
3. Diameter reduced by 10% due to corrosion or wear (independent of breakage).
4. Diameter reduced due to structural changes over lengthy sections.
5. Formation of baskets or loops, knots, necking, kinks or other mechanical damage.
6. Corkscrew-type deformation. Deformation deviation: $\geq 1/3 \times \text{rope diameter}$.
7. In addition, the rope must be replaced as required by DIN 15020, FEM 9.661 and ISO 4309.
8. In certain applications (e.g. twist-free wire rope, constant deadweight, recurrent stopping position, automatic operation etc.) wire fractures may occur inside the rope without being visible from outside.

Risk of accident!
In case of doubt please contact the manufacturer.

Mouflage

Cable et fixation du câble
A la mise en service d'un palan neuf ou lors d'un changement de câble sur des palans à plusieurs brins, il peut se produire un vrillage du câble. Cela se traduit par un décalage angulaire de la moufle, surtout à l'état sans charge. Un vrillage du câble compromet la sécurité et la durabilité.

Aussi faut-il éliminer tout vrillage !

- Toujours vérifier si le câble ne présente pas de vrillage. Pour ce faire, accoster les positions extrêmes, supérieure et inférieure du crochet sans charge.
- En cas de vrillage, dévriller aussitôt le câble. ↑ 44, "Mouflage du câble" et ↑ 94, "Dépose du câble".
- Contrôler le câble. Examiner particulièrement les parties du câble dans la zone des poulies de renvoi et d'équilibrage, et du point de fixation du câble.
- En cas de constatation de l'une des détériorations ci-après, remplacer immédiatement le câble :

1. Dépassement du nombre de ruptures de fils visibles, ↑ 92, tableau. Lors du contrôle le câble doit être exempt de charge pour mieux pouvoir reconnaître des ruptures de fils éventuelles en plant le câble à la main (env. rayon de la poulie à câble).
2. Touffe de fils cassés, ou rupture de toron.
3. Réduction de 10 % du diamètre du câble, due à la corrosion ou à l'abrasion (même sans rupture).
4. Réduction du diamètre du câble due à des modifications de structure sur de grandes longueurs.
5. Formation de cages et de boucles, nœuds, striction, pliure à angle vif, ou autres détériorations mécaniques.
6. Déformation en tire-bouchon. Tolérance de déformation : $\geq 1/3 \times \text{diamètre du câble}$.
7. De plus, le câble doit être déposé conformément aux consignes spécifiées dans les normes DIN 15020, FEM 9.661 et ISO 4309.
8. Dans certaines applications (p.ex. câble anti-giratoire, poids mort permanent, point d'arrêt

Unfallgefahr!

Im Zweifelsfall nehmen Sie bitte mit dem Hersteller Kontakt auf.

répétitif, service automatique, etc.), des ruptures de fils peuvent se former dans l'intérieur du câble sans être visibles de l'extérieur.
Risque d'accident!
En cas de doute veuillez s.v.p. contacter le fabricant.

Seiltrolle

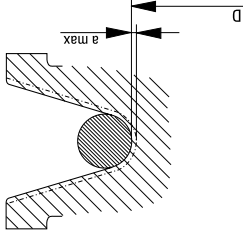
- Seiltrolle auf Verschleiß prüfen. Der Verschleiß ist schwierig zu bestimmen. Wir empfehlen eine Prüfung durch von uns geschultem Personal.

Rope sheave

- Check rope sheave for wear. Ascertaining the wear is difficult. We recommend having it checked by personnel trained by us.

Poulie à câble

- Vérifier l'usure de la poulie. Il est difficile de déterminer l'usure. Nous recommandons une vérification par du personnel formé par nous.



D (mm)	100 - 160	225	250	375
a max (mm)	1,5	2	2,5	3,0

Seilzug prüfen und warten

Inspecting and servicing wire rope hoist

Contrôle et entretien du palan

Seilabgereife aufgrund der vorhandenen Drahtbrüche

Broken wires necessitating replacement of wire rope

Seuil de réforme d'un câble en raison de rupture des brins

5,5	6,5	7,0	8,5	9,0	12,5	14	20	20
12	12	12	16	16	16	16	16	18
12	12	12	16	16	16	16	16	18

*1	*1	*2	*2	*2	*2	*2	*2	*10
4	4	5	5	5	5	5	5	6
8	8	8	10	10	10	10	10	11

33	36	42	54	54	75	84	120	120
165	180	210	270	270	375	420	600	600

8	8	10	10	10	10	10	11	11
16	16	16	19	19	19	19	19	22
165	180	210	270	270	375	420	600	600

8	8	10	10	10	10	10	11	11
16	16	16	19	19	19	19	19	22
165	180	210	270	270	375	420	600	600

Nicht drehungsames Drahtseil

Non twist-free wire rope

Cable non antigratoire

5,5	6,5	7,0	8,5	9,0	12	12,5	14	20
6	6	8	8	8	8	8	8	8
6	6	8	8	8	8	8	8	8

*8	*3	*4	*4	*4	*9	*4	*4	*6
5	5	6	6	6	9	6	6	12
10	10	13	13	13	18	13	13	24

33	36	42	54	54	72	75	84	120
165	180	210	270	270	360	375	420	600

10	10	13	13	13	18	13	13	24
19	19	26	26	26	35	26	26	48
165	180	210	270	270	360	375	420	600

* Seilkonstruktion ↑ Datenblatt

*1 = 18x7 SE

*2 = 18x7 SES Spezial

*3 = 6x19 FE

*4 = 6x19 SES

*5 = 8x36 WS-SES Spezial

*6 = 8x36 WS-SES

*7 = 7x19 Aircraft-cable

*8 = 6x19 SES

*9 = 8 litziges Spezialseil

*10 = 1318

* Rope make-up ↑ data sheet

*1 = 18x7 SE

*2 = 18x7 SES Spezial

*3 = 6x19 FE

*4 = 6x19 SES

*5 = 8x36 WS-SES Spezial

*6 = 8x36 WS-SES

*7 = 7x19 Aircraft-cable

*8 = 6x19 SES

*9 = 8 litziges Spezialseil

*10 = 1318

* Structure du câble ↑ fiche technique

*1 = 18x7 SE

*2 = 18x7 SES Spezial

*3 = 6x19 FE

*4 = 6x19 SES

*5 = 8x36 WS-SES Spezial

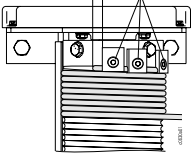
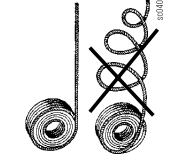
*6 = 8x36 WS-SES

*7 = 7x19 Aircraft-cable

*8 = 6x19 SES

*9 = 8 litziges Spezialseil

*10 = 1318



Typ	M.	Nm
SH 3.	M6	10
SH 3.	M10	40
SH 4.	M10	50
SH 5.	M10	50
SH 5.	M12	87
SH 6.	M12	87
SH 6.	M16	210

Changeement de cable

Les palans SH ont un câble spécial répondant de façon optimale aux exigences les plus fréquentes. La qualité, la résistance et la structure du câble de rechange doivent correspondre à celles du câble d'origine. Les caractéristiques du câble monté figurent sur la fiche technique ou sur le certificat du câble.

Replacing rope

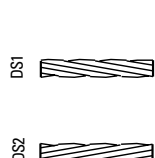
The SH wire rope hoists have a special rope which is the optimum for the most frequent applications. The replacement rope must be equivalent to the original in terms of quality, strength and make-up. Please consult the data sheet or the rope certificate to see the rope fitted.

In the case of 2 wire ropes with different lays

- wire rope with right-hand lay (DS1) on rope drum with left-hand groove
- wire rope with left-hand lay (DS2) on rope drum with right-hand groove

Bei 2 Drahtseilen mit unterschiedlicher Schlagrichtung

- rechtsgängiges Drahtseil (DS1) auf linksgeschchnittener Seiltrommel aufgelegt
- linksgängiges Drahtseil (DS2) auf rechtsgeschchnittener Seiltrommel aufgelegt



Removing rope

- Lower bottom hook block to just before the lowest hook position and set it down on a firm support
- Release end of wire rope in rope wedge
- Remove rope guide, ↑ 106, "Removing rope guide"
- Run the remaining rope off the drum
- Unscrew the fixing screws in the clamping plates on the rope drum.

Seil ablegen

- Hakenflasche bis kurz vor die tiefste Hakenstellung fahren und auf fester Unterlage aufliegen
- Seilende im Seilstoppunkt (Seil-schluss mit Seilkeil) lösen
- Seilführung ausbauen, ↑ 106, "Seilführung ausbauen"
- Restliches Seil von der Trommel ablaufen lassen
- Befestigungsschrauben der Klemmplatten auf der Seiltrommel lösen

Replacing rope

- Unroll new rope straight if possible, without twists, kinks or loops. Protect rope from dirt
- Attach rope to rope drum with all the clamping plates (do not forget the lock washers!) Allow the rope end to project by approx. 30-40 mm.
- Tightly wind about 5-10 turns onto the drum under power. Let the rope run through a greased rag. Type of grease ↑ 118.
- Fit rope guide, ↑ 96 "fitting rope guide"
- Reeve the loose end of the rope according to the number of falls, fasten with the rope wedge and a rope clamp, ↑ 44 "Reeving rope"
- Retighten clamping plates. Tightening torques ↑ table.
- Cautions! Risk of accident! After fitting a new rope, or shortening the old one, reset the hoist limit switch, ↑ 70.
- Adjusting hoist limit switch". If the new rope twists after some time in operation, untwist the rope immediately. ↑ 44, "Reeving rope" and ↑ "Removing rope"

Seil auflegen

- Neues Seil ohne Drall, Knicke oder Schlaufen abrollen, wenn möglich gerade auslegen. Seil vor Verschmutzung schützen.
- Seil auf der Seiltrommel mit allen Klemmplatten befestigen (Sicherungs-scheiben nicht vergessen!). Seilende ca. 30-40 mm überstehen lassen.
- Seil etwa 5-10 Windungen stramm mit motorischem Antrieb aufwickeln. Dabei Seil durch einen gefetteten Lappen laufen lassen. Fettsorte ↑ 118.
- Seilführung einbauen, ↑ 96, "Seilführung einbauen"
- Losses Seilende je nach Strangzahl einscheren, mit dem Seilkeil befestigen und mit einer Seilklemme sichern, ↑ 44, "Seil einscheren"
- Klemmplatten nochmals nachziehen. Anzugsmomente ↑ Tabelle
- Achtung Unfallgefahr! Nach Auslegen eines neuen bzw. nach dem Kürzen des alten Seils Endscharter neu einstellen. ↑ 70, "Hubtrottschalter einstellen"
- Zeigt das neue Seil nach einiger Betriebszeit einen Drall, Seil sofort entdrallen. ↑ 44, "Seil einscheren" und ↑ "Seil ablegen".

Inspecting and servicing wire rope hoist

Contrôle et entretien du palan

Dépose du câble

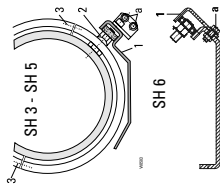
- Faire descendre la moufle jusque peu avant la position la plus basse du crochet et la poser sur un support rigide.
- Desserrer l'extrémité du câble dans le point de fixation (cosse à coin avec coin).
- Déposer le guide-câble, ↑ 106, "Dépose du guide-câble"
- Dérouler du tambour le restant du câble.
- Desserrer les vis de fixation des patins de serrage sur le tambour à câble.

Pose du câble

- Dérouler, si possible en ligne droite, le câble neuf, sans vrillage, plures à angle vif ni boucles. Protéger le câble contre l'encrassement.
- Fixer le câble sur le tambour avec toutes les pattes de serrage (ne pas oublier les rondelles-freins !). Laisser dépasser le bout de câble d'environ 30 à 40 mm.
- En utilisant le moteur d'entraînement, enrouler 5 à 10 spires de câble en assurant une bonne tension. Faire passer le câble à travers un chiffon enduit de graisse. Sorte de graisse, ↑ 118.
- Monter le guide-câble, ↑ 96, "Montage du guide-câble"
- Moufler le bout libre du câble en fonction du nombre de brins, le fixer avec le coin de câble et le bloquer avec un serre-câble, ↑ 44, "Mouflage du câble"
- Serrer de nouveau les pattes de fixation. Pour les couples de serrage, ↑ tableau.
- Attention, risque d'accident ! Après la pose d'un câble neuf ou le raccourcissement de l'ancien, procéder à un nouveau réglage de l'interrupteur de fin de course. ↑ 70, "Réglage de l'interrupteur d'urgence en fin de course de levage"
- Si, après quelque temps de fonctionnement, le câble neuf présente un vrillage, le dévriller immédiatement. ↑ 44, "Mouflage du câble" et ↑ "Dépose du câble"

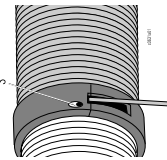
Seilführung ausbauen

- Möglichkeit (zu bevorzugen!)
 - Schutzblech (1) unter der Seiltrommel an den Stellen (a) abschrauben. Der Seilführungsring ist damit frei drehbar.
 - Anschlag mit Lager (2) nicht abschrauben!
 - Schrauben (3) lösen
 - Ringhelfen abnehmen
 - Seilspannfeder austhängen.



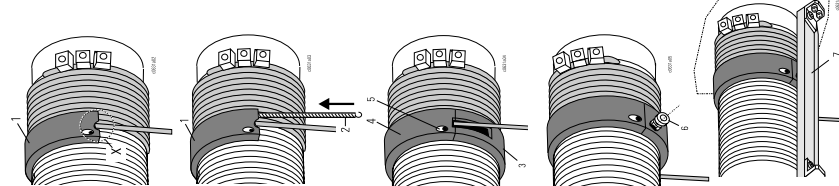
2. Möglichkeit

- Anschlag mit Lager (2) vom Seilführungsring abschrauben. Der Seilführungsring ist damit frei drehbar. Weiter wie bei 1.
- Achtung:** Der Anschlag mit Lager (2) ist mit Spannscheibe DIN 6796 gesichert. Diese Sicherung muss wieder einwandfrei montiert werden.



Seilführung einbauen

- Gewindengänge und Seilführungen gut einfetten.
- Ringhelfe (1) mit kurzem Fensterstiel so neben die letzte Seilwindung um die Trommel legen, dass das Seil im Bereich des Fensterstiels (x) austritt.
- Seilspannfeder (2) in die Führungs- nut der Seilführungsringhelfe (1) einschieben und die Feder- enden gegenseitig einhängen. (Als Hilfsmittel eine Gripzange verwenden).
- Zweite Ringhelfe (3) mit langem Seilaustrittsfenster so auf die Seiltrommel auflegen, dass das Seil gerade und ohne Knick von der Trommelrinne aus dem Fenster austritt. Die zweite Ringhelfe muss ohne Versatz an die erste Ringhelfe anschließen.
- Beide Ringhelfen mit Druckfedern und Schrauben (5) zusammen-schrauben.
- Die Seilführung muss federnd auf der Trommel aufliegen und von Hand drehbar sein. Ist dies nicht der Fall, liegt ein Einbaufehler vor oder die Seiltrommel ist be-schädigt.
- Anschlag mit Lager und Spannscheibe (6) in den Seilführungs-ring einschrauben.
- Schutzblech (7) anschrauben.



Removing rope guide

- 1st method (preferable!)
 - UnscREW protective plate (1) under the rope drum at points (a).
 - The rope guide can then be rotated freely.
 - Do not** unscREW stop with bearing (2)!
 - UnscREW bolts (3).
 - Remove half-rings.
 - Unhook rope tensioning spring.

2nd method

- UnscREW stop with bearing (2) from rope guide. The rope guide can then be rotated freely.
- Continue as described under 1.
- Caution:** The stop with bearing (2) is secured with a conical spring washer DIN 6796. This spring must be refitted correctly.

Fitting rope guide

- Grease thread and rope guide groove thoroughly.
- Place the half-ring (1) with the short window section onto the rope drum next to the last rope winding so that the rope exits from the region of the window (x).
- Push rope tensioning spring (2) into the guide groove of the half-ring (1) and hook the ends of the spring together. (Use gripper pliers for assistance).
- Place the second half-ring (3) with the long rope exit window on the rope drum so that the rope exits from the drum groove through the window straight and without kinking. The second half-ring must lie flush against the first.
- Bolt the two half-rings together with pressure screws and bolts (5).
- The rope guide must rest lightly on the drum and be able to be turned by hand. If this is not the case the guide has been fitted wrongly or the rope drum is damaged.
- Screw stop with bearing and conical spring washer (6) to the rope guide.
- Bolt on protective plate (7).

Dépense du guide-câble

- 1^{ère} possibilité (à choisir de préférence)
 - Dévisser la tôle de protection (1) sous le tambour à câble aux points "a". La bague guide-câble peut alors tourner librement. **Ne pas** dévisser la butée avec palier (2)!
 - Desserler les vis (3)
 - Enlever les demi-bagues.
 - Débrancher le ressort de tension du câble.

2^{ème} possibilité

- Dévisser de la bague guide-câble la butée avec palier (2). La bague guide-câble peut alors tourner librement. Suite des opérations comme au point précédent.
- Attention !** La butée avec palier (2) est assurée par une rondelle élastique bombée DIN 6796. Cette sécurité doit être remontée impeccablement.

Pose du guide-câble

- Bien enduire de graisse les pas de vis et la gorge guide-câble.
- Poser à côté de la dernière spire du câble sur le tambour, la demi-bague (1) avec la partie **courte** de la fente de passage du câble, de sorte que le câble sorte dans la zone de la partie de la fente (x).
- Poser le ressort de tension du câble (2) dans la gorge du guidage de la demi-bague guide-câble (1) et accrocher l'une à l'autre les extrémités du ressort (comme outil, utiliser une pince-étau).
- Poser sur le tambour à câble, la deuxième demi-bague (3) avec la partie **longue** de la fente de passage du câble, de sorte que le câble quittant la rainure du tambour sorte de la fente tout droit et sans pliure. Les deux demi-bagues doivent s'assembler sans décalage.
- Assembler les deux demi-bagues au moyen de ressorts de compression et de vis (5).
- Le guide-câble doit faire ressort sur le tambour, et il doit être possible de le faire tourner à la main.** Si ce n'est pas le cas, c'est qu'il est mal monté ou que le tambour à câble est détérioré.
- Visser la butée avec palier et la rondelle élastique bombée (6) dans la bague de guidage du câble.
- Visser la tôle de protection (7).

Laufträder, Laufdrad-trieb und Laufbahn

- Sichtprüfung der Laufträder auf Abrieb. Wechsel bei Verringerung der Ausgangswerte um max. 5%.
- Sichtprüfung des Laufbahn-trägers auf Abrieb.

Wheels, wheel drive and runway

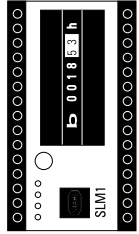
- Visual inspection of wheels for wear. Replacement if original values are reduced by max. 5%.
- Visual inspection of runway girder for wear.

Roues, entraînement des roues, et chemin de roulement

- Contrôle visuel de l'abrasion des roues. Remplacement en cas de réduction de max. 5 % des valeurs initiales.
- Contrôle visuel de l'abrasion du profilé de roulement.

Restnutzungsdauer

Nach FEM 9.755 muss die Betriebsweise und die Laufzeit vom Betreiber erfasst und im Prüfbuch protokolliert werden um die Restnutzungsdauer zu ermitteln. Nach Ablauf der Nutzungsdauer ist eine Generalüberholung (S.W.P)*1 durchzuführen.



Remaining service life

According to FEM 9.755, the operating mode and operating time must be established by the user and recorded in the test log book in order to calculate the remaining service life. After the service life has expired a general overhaul (S.W.P)*1 must be carried out.

Wire rope hoists which are equipped with controls ex works are thus fitted with a suitable device. Various designs are used: men verschiedene Ausführungen zum Einsatz:

Durée restante d'utilisation

Selon F.E.M. 9.755, l'exploitant doit relever le mode de service ainsi que la durée de marche et les consigner dans le livret de contrôle pour permettre de déterminer la durée restante d'utilisation. Après expiration de la durée d'utilisation, une révision générale selon (S.W.P)*1 doit être exécutée.

Dans les palans équipés, départ usine, d'une commande, il est donc incorporé un appareil de saisie de données correspondant. Diverses versions sont installées :

Betriebsstundenzähler in den Auswertegeräten SLM1 und SLE1

Der Betriebsstundenzähler im Auswertegerät der Überlastabschaltung addiert die Laufzeit des Hubwerks. Um die verbrauchte Lebensdauer in Vollaststunden zu erhalten, sind die Betriebsstunden mit dem Lastfaktor "k" zu bewerten. Dies wird im Rahmen der jährlichen "Wiederkehrenden Prüfung" von einer Fachkraft erledigt. Wenn 90% der theoretischen Vollastlebensdauer verbraucht sind, muss eine Generalüberholung (GÜ) zum nächstmöglichen Termin festgelegt und durchgeführt werden. (Siehe auch Seite 100).

Operating hours counter in evaluation devices SLM1 and SLE1

The operating hours counter in the evaluation device of the overload cut-off adds up the operating time of the hoist. In order to obtain the lifetime expired in full load hours, the operating hours must be determined with load factor "k". This is carried out by a qualified person, during the annual "periodic test". If 90% of the theoretical full load lifetime has expired, a general overhaul (GO) must be scheduled and carried out at the earliest possible date, ↑ 100.

Compteur d'heures de fonctionnement dans les analyseurs SLM1 et SLE 1

Le compteur d'heures de fonctionnement dans l'analyseur du système d'arrêt automatique en cas de surcharge additionne les temps de fonctionnement du palan. Afin d'obtenir en heures sous pleine charge la durée de vie éolée, les heures de fonctionnement doivent être déterminées avec le facteur de charge "k". Cela est effectué par une personne qualifiée dans le cadre du "contrôle périodique". Si 90 % de la durée théorique de vie sous pleine charge sont écoulés, une révision générale (RG) doit être prévue et exécutée à la première occasion possible, ↑ 100.

Seilzug prüfen und warten

Inspecting and servicing wire rope hoist

Contrôle et entretien du palan

Überwachungselektronik SMC1

Die Laufzeiten des Hubwerks werden in "Echzeit" und in Vollastbetriebsstunden gespeichert. Das SMC1 berechnet aus der jeweiligen Hublast und den Echzeitstunden die Vollastbetriebsstunden. Die Restlebensdauer wird unter Berücksichtigung der Triebwerksgruppe errechnet und kann mit einem PC (Laptop) ausgelesen werden.

Ist die theoretische Vollastlebensdauer verbraucht, dies wird auch durch das Aufleuchten einer roten LCD angezeigt, muss eine Generalüberholung eingeplant und durchgeführt werden.

Hinweis:

Die abgelesenen Vollastbetriebsstunden ersetzen nicht die vorgeschriebenen Prüfungen (einschl. Prüfung der Verschleißteile (Seilumlenkrollen, ...))

Generalüberholung

S.W.P = Safe Working Period

Das Triebwerk (Motor und Getriebe; betrifft nicht die Verschleißteile) des Seilzuges SH... ist nach FEM 9.511 eingestuft. Es gelten für üblichen Hebezeigensatz nebenstehende theoretische Vollastlebensdauern (D). Ist die Vollastlebensdauer (D) abzüglich der verbrauchten Lebensdauer gleich Null, muss der Seilzug vom Hersteller überholt werden.

Die Überholung der im Kraftfluss liegenden Bauteile darf nur vom Hersteller durchgeführt werden.

FEM 9.511	2m	3m	4m
D [h]	1600	3200	6400



Monitoring electronics SMC1

The operating time of the hoist is stored in "real time" and in full load operating hours. The SMC1 calculates the full load operating hours from the relevant hoisted load and the real time hours. The remaining service life is calculated with reference to the mechanism group and can be read by means of a PC (laptop).

If the theoretical full load lifetime has expired, this is also indicated by an illuminated red LCD. a general overhaul must be scheduled and carried out.

NB.:

Reading off the full load working hours does not take the place of the prescribed tests incl. checking wearing parts (rope, return sheaves, ...)

Remarque:

La lecture des heures de fonctionnement sous pleine charge ne remplace pas les contrôles prescrits incl. le contrôle des pièces d'usure (câble, poulies de renvoi, ...)

General overhaul

S.W.P = Safe Working Period

The mechanism (motor and gear; wearing parts not applicable) of the SH... wire rope hoist is classified according to FEM 9.511. The theoretical full load lifetime in hours shown opposite (D) is applicable for normal hoist applications. If the full load lifetime (D) minus the rope hoist must be overhauled by the manufacturer.

Components which are in the power flux may only be overhauled by the manufacturer.

Revision générale

S.W.P = Safe Working Period"

Le mécanisme d'entraînement (moteur et engrenage ; ne concerne pas les pièces d'usure) du palan SH... est classé selon FEM 9.511. Les heures théoriques de durée de vie sous pleine charge (D) indiquées ci-contre s'appliquent pour l'utilisation courante de palans.

Lorsque la durée de vie sous pleine charge (D) moins la durée de vie écoulée est égale à zéro, il faut faire réviser le palan par le fabricant.

La révision des éléments de construction se trouvant dans la transmission de puissance ne doit être exécutée que par le fabricant.

*1 période de travail en sécurité

Fehlersuche

Fault-finding

Recherche des pannes

Was tun wenn?

What should be done if...?

Que faire si ?

Seilzug läuft nicht an, Motor brummt
• Es sind nicht alle Stromphasen vorhanden.
1. Sicherungen prüfen,
2. Zuleitungen prüfen,
3. Steuer- und Schaltgeräte prüfen.

Wire rope hoist does not start, motor hums
• Not all power phases are present.
1. Check fuses,
2. Check supply cable,
3. Check control pendant and switchgear.

Le palan ne démarre pas, le moteur bourdonne.
• Il manque au moins une phase du courant.
1. Vérifier les fusibles,
2. Vérifier la ligne d'alimentation,
3. Vérifier les appareils/les commandes et de couplage.

Seilzug läuft schwer an

• Motor läuft gegen geschlossene Bremse
1. Bremse prüfen, ↑ 62.

Wire rope hoist starts with difficulty
• Motor is running against the closed brake
1. Check brake, ↑ 62.

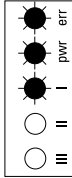
Le palan démarre difficilement
• Le moteur tourne alors que le frein est serré.
1. Contrôler le frein, ↑ 62.

Last wird nicht angehoben

• Überlastabschaltung hat angesprochen oder ist defekt.
1. Überlastabschaltung überprüfen, ↑ 80.
2. Maßnahmen zum SLE 1 LED I...III "ein" und LED err "ein" => Fehler.

Load is not lifted
• Overload cut-off has been actuated or is defective.
1. Check overload cut-off, ↑ 80.
2. Measures for SLE1 LED I...III "on" and LED err => error.

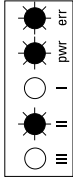
La charge n'est pas soulevée
• Le système d'arrêt automatique en cas de surcharge est entré en action ou est défectueux.
1. Contrôler le système d'arrêt automatique en cas de surcharge, ↑ 80.
2. Mesures à prendre pour SLE 1 DEL I...III „Marche“ et DEL err „Marche“ => Erreur.



Fehlerspezifikation
Sensorfehler (Strom <1mA)
Fehlerbehebung
Anschlüsse prüfen
Sensor austauschen

Error specification
Sensor error (current <1mA)
Elimination of error
Check connections
Replace sensor

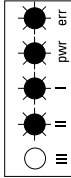
Spécification de défaut
Défaut de capteur (intensité <1 mA)
Élimination du défaut
Vérifier les raccords
Remplacer le capteur.



Fehlerspezifikation
Überlast
Fehlerbehebung
Seilzug entlasten

Error specification
Overload
Elimination of error
Remove load from hoist

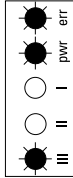
Spécification de défaut
Surcharge
Élimination du défaut
Supprimer la charge du palan à câble



Fehlerspezifikation
Übertemperatur
Fehlerbehebung
Motor abkühlen lassen
Kaltleiter prüfen

Error specification
Overtemperature
Elimination of error
Allow motor to cool down
Check thermistors

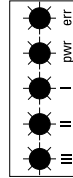
Spécification de défaut
Température excessive
Élimination du défaut
Laisser refroidir le moteur.
Vérifier la thermistance.



Fehlerspezifikation
Tipptrieb > 7x / sec
Fehlerbehebung
Anlage Aus/Ein schalten
Tipptrieb vermeiden

Error specification
Inching operation > 7x / sec
Elimination of error
Switch apparatus on/off
Avoid inching operation

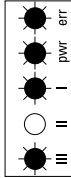
Spécification de défaut
Fonct. par impulsions > 7x / sec
Élimination du défaut
Mettre l'installation hors/sous tension
Éviter le fonctionnement par impulsions.



Fehlerspezifikation
Sensorfehler (Strom >24,5mA)
Fehlerbehebung
Anschlüsse prüfen
Sensor austauschen

Error specification
Sensor error (current >24,5mA)
Elimination of error
Check connections
Replace sensor

Spécification de défaut
Défaut de capteur (intensité >24,5 mA)
Élimination du défaut
Vérifier les raccords
Remplacer le capteur.



Fehlerspezifikation
Ansteuerungsfehler
Fehlerbehebung
R. STAHL-Kundendienst anfordern

Error specification
Control error
Elimination of error
Request R. STAHL after sales service

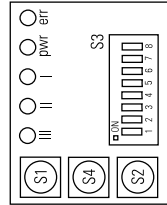
Spécification de défaut
Défaut d'actionnement
Élimination du défaut
Prévenir le service après-vente
R. STAHL

Fehlersuche

Fault-finding

Recherche des pannes

Korrektur-Abschaltsschwelle



- Besondere Hubwerkeinbaubedingungen können eine Korrektur der Abschaltsschwelle erfordern.

Rough adjustment with S4
~ 16% / Pos
Fine adjustment with S2
~ 1% / Pos

Achtung: 110% Nennlast nicht überschreiten

3. Maßnahmen zum SLM 1

3. Actions for SLM 1

3. Mesures à prendre pour SLM 1

Fehlerspezifikation

Übertemperatur erkannt
Fehlerbeseitigung
Motor abkühlen lassen
Kaltleiter prüfen

Spezifikation de défaut
Température excessive identifiée
Élimination du défaut
Laisser refroidir le moteur
Vérifier la thermistance.

Fehlerspezifikation

Überlast vorhanden
Anschlusskabel unterbrochen
Sensor defekt
Fehlerbeseitigung
Seilzug entlasten
Anschlusskabel prüfen
Sensor austauschen

Spezifikation de défaut
Présence de surcharge
Câble de raccordement interrompu
Capteur défectueux
Élimination du défaut
Supprimer la charge du palan à câble.
Vérifier le câble d'alimentation.
Remplacer le capteur.

Fehlerspezifikation

Überlast vorhanden
Fehlerbeseitigung
Seilzug entlasten

Spezifikation de défaut
Présence de surcharge
Élimination du défaut
Supprimer la charge du palan à câble.
Correction du seuil de déconnexion ↑ 104

Hakenflasche und Seil verdrehen sich

• Seil hat einen Drall.
1. Seil entdrallen, ↑ 92, "Seil wechseln".

Bottom hook block and rope twist

• Rope is twisted.
1. Unwist rope, ↑ 92, "Replacing rope".

Bremsweg zu groß

• Bremslftweg zu groß.
• Bremsbelag verschlissen.
Brems Scheibe austauschen, ↑ 62, "Hubwerksbremse", ↑ 64, "Trolley brake".

Distance de freinage trop grande
• La course de desserrage du frein est trop grande.
• Garniture de frein usée.
Remplacer le disque de frein, ↑ 62, "Frein du palan", ↑ 64, "Frein du chariot".

Fehlersuche

Fault-finding

Recherche des pannes

Last wird nicht angehoben
• Überlastabschaltung hat angesprochen oder ist defekt.

Maßnahmen zum LEI

Load is not lifted
• Overload cut-off has been actuated or is defective.
Measures for LEI

Fehler

Sensormotor erreicht nicht Schalt-schwelle
Fehlerspezifikation
• Transportsicherungen nicht entfernt

Fault

Sensor current does not reach operating point
Specification of fault
• Transport anchor bolts not removed

• Anschlagblech verschlissen, Getriebe schlägt an Scher-buchse an
• Seilzugbefestigung nicht ausgerichtet, Getriebe und Tragblech verspannt
Fehlerbeseitigung
Transportsicherungen entfernen
Anschlagblech überprüfen und ggf. ersetzen
Freigängigkeit überprüfen

• Stop plate worn, gear touches shear bushing
• Hoist mounting not correctly aligned, gear and support plate twisted
Elimination of fault
Remove transport anchor bolts
Check stop plate and replace if necessary
Check ease of movement

Fehlerspezifikation

Entfernen des Motors
• Vis d'arrêt de transport pas enlevées
• Tôle d'arrêt usée, réducteur touche la douille de cisaillement
• Fixation du palan pas alignée, réducteur et tôle de support gauchis
Élimination du défaut
Enlever les vis d'arrêt de transport
Vérifier la tôle d'arrêt et la remplacer, le cas échéant
Vérifier le mouvement libre

Fehler

Ruhestrom > 7 mA
Fehlerspezifikation
• Zusätzliches Drehmoment (Zusatzlasten an Motor oder Getriebe)

Fault

Closed-circuit current > 7 mA
Specification of fault
• Additional torque (additional loads on motor or gear)

• Sensorzuordnung nicht korrekt (zu hohe Empfindlichkeit - Eigenlast durch Getriebemotor erzeugt zu hohes Signal - max. Ruhestrom 7 mA)
Fehlerbeseitigung
Sensor ersetzen

• Incorrect sensor assignment (sensitivity too high - dead load from gear motor generates too high a signal - max. closed-circuit current 7 mA)
Elimination of fault
Replace sensor

Fehler

Ruhestrom < 1mA
Fehlerspezifikation
• Kabelbruch
• Sensor defekt
Fehlerbeseitigung
Sensor ersetzen

Fault

Closed-circuit current < 1 mA
Specification of fault
• Cable break
• Sensor defective
Elimination of fault
Replace sensor

Fehler

Ruhestromverkleinerung um 0,5 mA zu Einstellwert
Fehlerspezifikation
• Sensor wurde überlastet (bleibende Verformung am Mess-aufnehmer)
Fehlerbeseitigung
Sensor ersetzen

Fault

Closed-circuit current 0.5 mA below set value
Specification of fault
• Sensor overloaded (permanent distortion of pickup)
Elimination of fault
Replace sensor



Fehlersuche

Fault-finding


Recherche des pannes

Fehler Ruhestrom wird bei Entlastung nicht erreicht	Fault Closed-circuit current not reached in unloaded condition	Défaut Courant de repos pas atteint en état déchargé
Fehlerspezifikation <ul style="list-style-type: none">die freie Beweglichkeit des Getriebes ist eingeschränkt	Specification of fault <ul style="list-style-type: none">Free movement of gear is restricted	Spécification du défaut <ul style="list-style-type: none">Le mouvement libre du réducteur est réduite
Fehlerbeseitigung Neue Ausrichtung der Tragblechbefestigung Tragblech muss am Rillenkugellager axial möglichst spielfrei anliegen - Einstellmöglichkeit über Transportsicherungen, Befestigungsschrauben und Scherbuchse	Elimination of fault Realign mounting of support plate Support plate must sit axially on grooved ball bearing with as little play as possible - can be adjusted via transport anchor bolts, fixing bolts and shear bushing	Élimination du défaut Redresser la fixation de la tôle de support La tôle de support doit tenir axialement au roulement rainuré à billes avec le moindre jeu possible - elle peut être ajustée par les vis d'arrêt de transport, les vis de fixation et la douille de cisaillement
Fehler Sensor verändert seine Lage zum Getriebe	Fault Sensor has changed position with respect to gear	Défaut Le capteur a changé de position par rapport au réducteur
Fehlerspezifikation <ul style="list-style-type: none">Sensor wurde nicht mittels Stiftschraube gesichert	Specification of fault <ul style="list-style-type: none">Sensor not secured with locking screw	Spécification du défaut <ul style="list-style-type: none">Capteur pas bloqué par un goujon fileté
Fehlerbeseitigung Stiftschraube montieren (Schraubensicherung mittels Loctitekleber) Arretierung des Lastsensors prüfen	Elimination of fault Fit locking screw (secure screw with Loctite), check locking of load sensor	Élimination du défaut Monter un goujon fileté (l'arrêter avec du Loctite), vérifier l'arrêtae du capteur

Technische Daten

Technical data

Caractéristiques techniques

Einstufung des Triebwerks, Seiltriebs und Motors nach FEM					Classification of mechanism, rope drive and motor acc. to FEM					Classification du mécanisme d'entraînement, du mouillage et du moteur selon F. E. M.				
					FEM									
1/1	2/1	4/1	6/1	8/1	1Am	1Am	1Am	2m	2m	2m	3m	3m	3m	
500	1000	2000			FEM 9.511 *2	FEM 9.511 *2	FEM 9.511 *2							
630	1250	2500			FEM 9.602 *3	FEM 9.602 *3	FEM 9.602 *3							SH 3005-25 SH 3005-40
800	1600	3200						SH 3006-25 SH 3006-40	SH 3006-25 SH 3006-40					
1000	2000	4000						SH 3008-20 SH 3008-32	SH 3008-20 SH 3008-32	SH 4010-25 SH 4010-40				SH 4008-25 SH 4008-40
1250	2500	5000						SH 4012-20 SH 4012-32	SH 4012-20 SH 4012-32					
1600	3200	6300			SH 4016-16 SH 4016-25									SH 5016-25 SH 5016-40
2000	4000	8000								SH 5020-25 SH 5020-40				
2500	5000	10000						SH 5025-20 SH 5025-32	SH 5025-20 SH 5025-32					SHR 6025-20 SHR 6025-32 SHR 6025-40
3200	6300	12500			SH 5032-25				SHR 6032-20 SHR 6032-32 SHR 6032-40					
	8000	16000				SHR6040-12 SHR6040-20 SHR6040-32					SH6040-20 SH6040-32 SH6040-40			
	10000	20000						SH 6050-16 SH 6050-25 SH 6050-40	SH 6050-16 SH 6050-25 SH 6050-40					
	12500	25000			SH 6063-12 SH 6063-20 SH 6063-32									

Schutzart gegen Staub und Feuchtigkeit nach EN 60 529 Allgemein: IP 55	Protection against dust and moisture to EN 60529 General: IP 55	Type de protection contre la poussière et l'humidité selon EN 60 529 En général : IP 55
Zulässige Umgebungstemperaturen -20°C ... +40°C (Standard) -20°C ... +60°C (Option) - 5°C ... + 80°C (Option) -40°C ... + 40°C (Sonderausführung)	Permissible ambient temperature -20°C ... +40°C (standard) -20°C ... +60°C (optional) - 5°C ... + 80°C (optional) -40°C ... + 40°C (special design)	Températures ambiantes admissibles -20°C ... +40°C (standard) -20°C ... +60°C (option) - 5°C ... + 80°C (option) -40°C ... + 40°C (modèle spécial)

*1 Seiltrieb	*1 Rope drive	*1 Mouflage
*2 Triebwerk	*2 Mechanism	*2 Mécanisme d'entraînement
*3 Motor	*3 Motor	*3 Moteur



Technische Daten

Technical data

Caractéristiques techniques

Fahrmotordaten Fahrmotoren für Einschiennen- fahrwerke, ↑ Tabelle 1	Travel motor data Travel motors for monorail trolleys, ↑ Table 1		Caractéristiques des moteurs de translation Moteurs de translation pour chariots monorails, ↑ tableau 1			
	Travel motors for double rail crabs, ↑ Table 2		Moteurs de translation pour chariots birails, ↑ tableau 2			
Fahrmotoren für Zweischienen- fahrwerke, ↑ Tabelle 2						

1

 kg				380...415 V, 50 Hz			380...415 V, 60 Hz		
				5/20 m/min	2,5/10 m/min	8/32 m/min	6,3/25 m/min	3,2/12,5 m/min	10/40 m/min
	1/1 2/2	2/1 4/2	4/1	kW % ED	kW % ED	kW % ED	kW % ED	kW % ED	kW % ED
1000	SH 30.. SH 40..	SH 3005		SF 17 113 123 0,09/0,37 20/40	SF 17 219 123 0,09/0,37 20/40	SF 17 109 123 0,09/0,37 20/40	SF 17 113 123 0,11/0,44 20/40	SF 17 219 123 0,11/0,44 20/40	SF 17 109 123 0,11/0,44 20/40
1250	SH 4012	SH 3006							
1600	SH 4016 SH 5016	SH 3008 SH 4008							
2000	SH 5020	SH 4010	SH 3005						
2500	SH 5025	SH 4012	SH 3006						
3200	SH 5032	SH 4016	SH 3008 SH 4008						
4000			SH 4010		SF 17 109 133 0,12/0,55 20/40				SF 17 109 133 0,15/0,66 20/40
5000			SH 4012						
6300			SH 4016						
3200		SH 5016		SF 17 219 123 0,09/0,37 20/40	SF 17 209 123 0,09/0,37 20/40	SF 17 219 123 0,11/0,44 20/40	SF 17 213 123 0,11/0,44 20/40	SF 17 219 123 0,11/0,44 20/40	SF 17 209 123 0,11/0,44 20/40
4000		SH 5020							
5000		SH 5025			SF 17 209 133 0,12/0,55 20/40				SF 17 209 133 0,15/0,66 20/40
6300			SH 5016						
8000			SH 5020	SF 17 219 313 0,12/0,55 20/40	SF 17 209 313 0,30/1,25 20/40		SF 17 213 133 0,15/0,66 20/40	SF 17 213 133 0,36/1,50 20/40	
10000			SH 5025						
12500			SH 5032	SF 17 213 313 0,30/1,25 20/40			SF 17 213 313 0,36/1,50 20/40		

Datos técnicos



Dados técnicos

Dati tecnici

Technische gegevens

Datos del motor de traslación Motores de traslación para mecanismos de traslación normal, ↑ tabla 1	Dados do motor de traslação Motores de traslação para carros de traslação monoviga, ↑ tabela 1	Dati motore di traslazione Motori per carrello monotrave, ↑ tabella 1	Gegevens rijmotor Rijmotor voor enkelligger, ↑ tabel 1
Motores de traslación para mecanismos de traslación birrail, ↑ tabla 2	Motores de traslação para carros de traslação bíviga, ↑ tabela 2	Motori per carrello bitrave, ↑ tabella 2	Rijmotor voor dubbelligger, ↑ tabel 2

2

 kg				380...415 V, 50 Hz			380...415 V, 60 Hz		
				5/20 m/min	2,5/10 m/min	8/32 m/min	6,3/25 m/min	3,2/12,5 m/min	10/40 m/min
	1/1 2/2	2/1 4/2	4/1	kW % ED	kW % ED	kW % ED	kW % ED	kW % ED	kW % ED
1000		SH 3005		SF 17 213 123 0,09/0,37 20/40	SF 17 219 123 0,09/0,37 20/40	SF 17 209 123 0,09/0,37 20/40	SF 17 213 123 0,11/0,44 20/40	SF 17 219 123 0,11/0,44 20/40	SF 17 209 123 0,11/0,44 20/40
1250		SH 3006							
1600		SH 3008 SH 4008							
2000		SH 4010	SH 3005						
2500		SH 4012	SH 3006						
3200		SH 4016	SH 3008 SH 4008						SF 17 209 133 0,12/0,55 20/40
4000			SH 4010						
5000			SH 4012						
6300			SH 4016						
3200		SH 5016		SF 25 226 123 0,09/0,37 20/40	SF 25 832 133 0,12/0,55 20/40	SF 25 222 123 0,09/0,37 20/40	SF 25 226 123 0,11/0,44 20/40	SF 25 832 133 0,15/0,66 20/40	SF 25 222 123 0,11/0,44 20/40
4000		SH 5020							
5000		SH 5025				SF 25 222 133 0,12/0,55 20/40			SF 25 222 133 0,15/0,66 20/40
6300			SH 5016						
8000			SH 5020	SF 25 226 133 0,12/0,55 20/40		SF 25 222 313 0,30/1,25 20/40	SF 25 226 133 0,15/0,66 20/40		SF 25 222 313 0,36/1,50 20/40
10000			SH 5025						
6300		SH 5032		SF 25 228 123 0,09/0,37 20/40	SF 25 834 133 0,12/0,55 20/40	SF 25 224 133 0,12/0,55 20/40	SF 25 228 123 0,11/0,44 20/40	SF 25 834 133 0,15/0,66 20/40	SF 25 224 133 0,15/0,66 20/40
12500			SH 5032	SF 25 228 313 0,30/1,25 20/40		SF 25 224 313 0,30/1,25 20/40	SF 25 228 313 0,36/1,50 20/40		SF 25 224 313 0,36/1,50 20/40
16000			SH 6040	SF 35 230 313 0,30/1,25 20/40	SF 35 836 133 0,12/0,55 20/40	SF 35 226 423 0,46/2,0 20/40	SF 35 230 313 0,36/1,50 20/40	SF 35 836 133 0,15/0,66 20/40	SF 35 226 423 0,56/2,40 20/40
20000			SH 6060						
25000			SH 6063	SF 35 230 423 0,46/2,0 20/40			SF 35 230 423 0,56/2,40 20/40		

Technische Daten

Technical data

Caractéristiques techniques

Leitungsquerschnitte und Zuleitungslängen
S = Mindestquerschnitt
L1 = max. Zuleitungslänge bei stationärem Hubwerk (ab Netzanschlussleistung $\Delta U = 5\%$)
L2 = max. Zuleitungslänge bei Hubwerk mit Fahrwerk (ab Klemmkasten Laufbahnenende $\Delta U = 4\%$)
Die angegebene Leitungslänge bezieht sich auf die Zuleitung zum Selbstzug.

Cable cross-section and length of supply cable
S = Minimum cross-section
L1 = Max. supply cable length for stationary hoist (from main fuse $\Delta U = 5\%$)
L2 = Max. supply cable length for hoist with trolley/crab (from terminal box at end of runway $\Delta U = 4\%$)
The supply cable length given refers to the supply cable to the wire rope hoist.

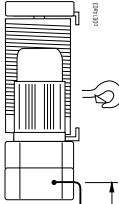
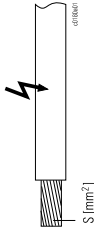
Section et longueur de câble d'alimentation
S = Section minimale
L1 = Longueur max. de câble d'alimentation pour palans stationnaires (à partir du fusible de branchement sur le secteur $\Delta U = 5\%$)
L2 = Longueur max. de câble d'alimentation pour palans à translation électrique (à partir de la boîte à bornes, en fin de chemin de roulement $\Delta U = 4\%$)
La longueur de câble indiquée se rapporte à la câble d'alimentation du palan.

Für die Koordination des Kurzschlusschutzes der Leistungsschütze und Leitungslängenberechnung wurde eine Schleifenimpedanz von maximal 250 mΩ zugrunde gelegt.

A loop impedance of max. 250 mΩ was taken as basis for coordinating the short circuit protection of the power contactors and calculating the cable lengths.

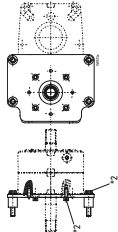
Pour la coordination du dispositif de protection contre les courts-circuits du contacteur de puissance et le calcul de la longueur de la ligne, on a pris pour base une impédance de boucle de 250 mΩ au maximum.

	50 Hz					
	S	L1	L2	S	L1	L2
*1	mm ²	m	m	mm ²	m	m
12/2433	1,5	43	32	1,5	67	50
12/2442	1,5	27	21	1,5	42	32
12/2462	2,5	22	17	2,5	34	26
12/2471	2,5	21	16	2,5	32	25
12/2472	4,0	23	18	4,0	35	28
12/2473	16	67	54	10	66	53
24/4492	25	55	44	16	55	44



Anzugsmomente für Schrauben
Alle Schrauben sind mit einem Drehmomentschlüssel anzuziehen. Die für Schraubengüte 8.8 allgemein gültigen Drehmomente ↑ tabelle. Für die Fußbefestigung am Fahrwerk gelten die Werte (X), für die Tragblechbefestigung am Getriebe die Werte (Y).

M.	Nm	*3			Y
		8.8	10.9	8.8	
M6	10				
M8	25				
M10	51	-	85		75
M12	87	-	130		87
M16	215	-	330		310
M20	430	-	-		-
M24	740	-	-		-
M30	1500	-	-	1500	-
M36	2600	-	-	-	-



*1 Hubmotortyp
*2 Standard
*3 Schraubengüte

*1 Hoist motor type
*2 Standard
*3 Bolt grade

*1 Type de moteur de levage
*2 Standard
*3 Qualité de visserie

Datos técnicos

Dados técnicos

Dati tecnici

Technische gegevens

Secciones transversales y longitudes de las líneas de alimentación
S = Sección mínima
L1 = long. máx. de la línea de alimentación en un mecanismo de elevación estacionario (desde los fusibles generales $\Delta U = 5\%$)
L2 = long. máx. de la línea de alimentación en un mecanismo de elevación estacionario con motor de traslación (a partir de una caja de bornes final de vía de rodadura $\Delta U = 4\%$)
La longitud indicada para las líneas se refiere a las líneas de alimentación que llegan al polipasto de cable.

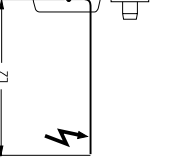
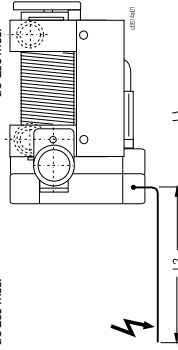
Secção dos cabos eléctricos e comprimento da linha de alimentação
S = Secção mínima
L1 = Comprimento máximo do cabo de alimentação em execução estacionária (desde fusíveis da estacionária rede $\Delta U = 5\%$)
L2 = Comprimento máximo do cabo de alimentação em diferencial de alimentação com carro (desde a caixa de bornes da extremidade do caminho de rolamento $\Delta U = 4\%$)
O comprimento de fio indicado refere-se à alimentação do diferencial de cabo.

Sezione e lunghezza dei cavi di alimentazione
S = sezione min.
L1 = lunghezza max. dei cavi di alimentazione per paranco in esecuzione fissa (fusibili di rete $\Delta U = 5\%$)
L2 = lunghezza max. dei cavi di alimentazione per paranco con carrello (dalla morsetteria all'estremità della via di corsa $\Delta U = 4\%$)
I valori indicati si riferiscono alla linea di alimentazione al paranco.
Per il coordinamento delle protezioni contro corti circuiti, telertut-tori di potenza e calcolo della linea di alimentazione è stata considerata una impedenza di 250 mΩ.

Para la coordinación de la protección contra cortocircuitos de los contactos de potencia y del cálculo de la longitud de los conductos se supuso una impedancia de bobina máxima de 250 mΩ.

Para coordenar a protecção contra curto-circuitos dos fusíveis da linha e cálculo do comprimento da linha partiu-se de uma impedância de propagação máx. de 250 mΩ.

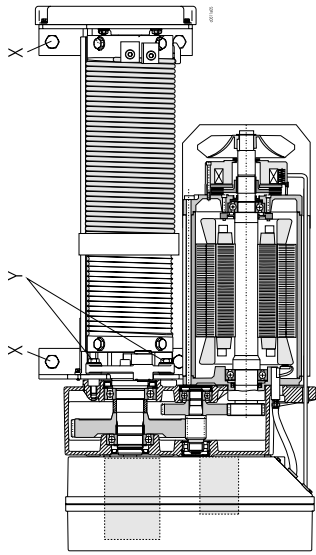
Voor de coördinatie van de kortsluitbeveiliging van de vermogensrelais en de berekening van de leidinglengte werd uitgegaan van een lusimpedantie van maximaal 250 mΩ.
De opgegeven leidinglengte heeft betrekking op de voedingsleiding naar de takel.
De opgegeven leidinglengte heeft betrekking op de voedingsleiding naar de takel.



Aantremomenten voor schroeven
Alle schroeven dienen met een momentsleutel te worden vastgedraaid. De voor schroefdikte 8.8 algemeen geldige aanhaalmomenten, ↑ tabel. Voor de voetbevestiging aan het rijwiel gelden de waarden (X), voor de montage plaatbevestiging aan de tandwielkast de waarden (Y).

Tightening torques for bolts
All bolts should be tightened with a torque spanner. The torques generally applicable for bolts grade 8.8 ↑ table. Values (X) are applicable for foot mounting, values (Y) for attachment of frame to gear.

Couples de serrage des vis
Toutes les vis doivent être serrées avec une clé dynamométrique. En ce qui concerne les couples généralement valables pour la qualité de visserie 8.8, ↑ tableau. Pour la fixation des pieds sur le chariot, prendre les valeurs (X), pour la fixation de la table-support sur le réducteur, les valeurs (Y).



*1 Hubmotortyp
*2 Standard
*3 Schraubengüte

*1 Hoist motor type
*2 Standard
*3 Bolt grade

*1 Type de moteur de levage
*2 Standard
*3 Qualité de visserie

*1 Modelo de motor de elevación
*2 Estándar
*3 Calidad de tornillos

*1 Tipo de motor de elevação
*2 Standard
*3 Qualidade dos parafusos

*1 Tipo motore
*2 Standard
*3 Qualità dei bulloni

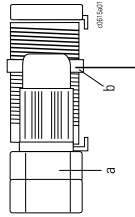
*1 Hismotor type
*2 Standard aantremoment
*3 Bout kwaliteit

Technische Daten

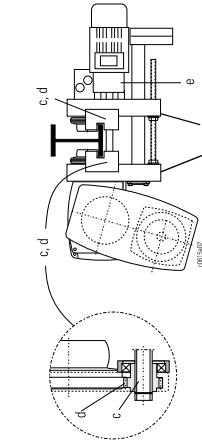
Technical data

Caractéristiques techniques

Schmierstoffe



Lubrifiants



A Position of lubrication point

B Schmierstoffart

- ◆ Fett
- Öl

C Kennzeichnung

D Schmierstoffmenge

E: Characteristics, Fabrikat

1	Viskosität: 460 /s40°C (220/s40°C) Pourpoint: -20°C (-40°C) Flammpunkt: +265°C (+320°C) z.B.: Fuchs Renolin CLP 460*, Aral Degol BG 460, BP Energol GR-XP 460, Esso Spartan EP 460, Mobil Gear 634, Tribol 1100/460, (Shell Tivela Oil WB)	1	Viscosité: 460 /s40°C (220/s40°C) Point de givage: -20° C (-40°C) Point d'inflammation: +265° C (+320° C) p. ex.: Fuchs: Fuchs Renolin CLP 460*, Aral Degol BG 460, BP Energol GR-XP 460, Esso Spartan EP 460, Mobil Gear 634, Tribol 1100/460, (Shell Tivela Oil WB)
2	Seifenbasis: Lithium + MoS ₂ Tropfpunkt: ca. 185°C Walkpenetration: 310-340 Betriebsstemperatur: -20°bis +120°C z.B.: Aralub PMD1*, BP Mehrzweck-fett L21M, Esso Mehrzweckfett M, Mobilin SHC 460, Shell Retinax AM, STABYL L-TS 1 Mo	2	Base de saponification : lithium + MoS ₂ Temp. de goutte : approx. 185°C Pénétration par foulage : 310 à 340 Temp. de fonctionnement : -20° à +120°C p. ex.: Aralub PMD1*, BP Mehrzweckfett L21M, Esso Mehrzweckfett M, Mobilin SHC 460, Shell Retinax AM, STABYL L-TS 1 Mo
3	Seifenbasis: Synthetik (Lithium) Tropfpunkt: ca. 150°C Walkpenetration: 400-430 (400-430) Betriebsstemperatur: -20°bis +80°C z.B.: Aralub FDP00, BP Energ grease HT-00 EP Esso Geriebefeisfett, Shell Spezial Geriebefeisfett H*, Mobilux Fieisfett EP 004, (Tivela Compound A)	3	Base de saponification : synthetik (lithium) Temp. de goute : approx. 150°C Pénétration par foulage : 400 à 430 Temp. de fonctionnement : -20° à +80°C p. ex.: Aralub FDP00, BP Energ grease HT-00 EP Esso Geriebefeisfett, Shell Spezial Geriebefeisfett H*, Mobilux Fieisfett EP 004, (Tivela Compound A)

A Position dupoint de lubrification

B Genre de lubrifiant

- ◆ Graisse
- Huile

C Référence

D Quantite de lubrifiant

E: Caractéristiques, marque

1	Viscosité: 460 /s40°C (220/s40°C) Point de figeage: -20° C (-40°C) Point d'inflammation: +265° C (+320° C) p. ex.: Fuchs: Fuchs Renolin CLP 460*, Aral Degol BG 460, BP Energol GR-XP 460, Esso Spartan EP 460, Mobil Gear 634, Tribol 1100/460, (Shell Tivela Oil WB)	1	Viscosité: 460/s40°C (220/s40°C) Point de fluidéz: -20° C (-40°C) Point de inflammation: +265°C (+320°C) p. ex.: Fuchs: Fuchs Renolin CLP 460*, Aral Degol BG 460, BP Energol GR-XP 460, Esso Spartan EP 460, Mobil Gear 634, Tribol 1100/460, (Shell Tivela Oil WB)
2	Base de saponification : lithium + MoS ₂ Temp. de goutte : approx. 185°C Pénétration par foulage : 310 à 340 Temp. de fonctionnement : -20° à +120°C p. ex.: Aralub PMD1*, BP Mehrzweckfett L21M, Esso Mehrzweckfett M, Mobilin SHC 460, Shell Retinax AM, STABYL L-TS 1 Mo	2	Base de sabão: Lítio MoS ₂ Temp. de goteio : aprox. 185°C Penetração Walk: 310-340 Temperatura operacional: -20°C até +120°C p. ex.: Aralub PMD1*, BP Mehrzweck-fett L21M, Esso Mehrzweckfett M, Mobilin SHC 460, Shell Retinax AM, STABYL L-TS 1 Mo
3	Base de saponification : synthetik (lithium) Temp. de goute : environ 150° C Pénétration par foulage : 400 à 430 Temp. de fonctionnement : -20° à +80°C p. ex.: Aralub FDP00, BP Energ grease HT-00 EP Esso Geriebefeisfett, Shell Spezial Geriebefeisfett H*, Mobilux Fieisfett EP 004, (Tivela Compound A)	3	Base de sabão: Synthetik (Lítio) Temp. de goteamento: aprox. 150°C Penetração Walk: 400-430 (400-430) Temp. operacional: -20°C até -80°C p. ex.: Aralub FDP00, BP Energ grease HT-00 EP Esso Geriebefeisfett, Shell Spezial Geriebefeisfett H*, Mobilux Fieisfett EP 004, (Tivela Compound A)

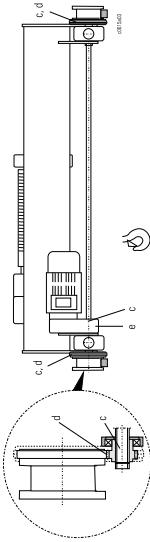
Datos técnicos

Dados técnicos

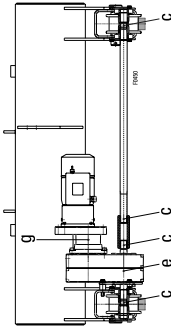
Dati tecnici

Technische gegevens

Lubrifiants



Lubrificantes



A Posición del punto de engrase

B Clase de lubricante

- ◆ Grasa
- Aceite

C Placa de características

D Cantidad de lubricante

E: Características, marcas

1	Viscosidad: 460 /s40°C (220/s40°C) Punto de fluidez: -20° C (-40°C) Punto de inflamación: +265° C (+320° C) p. ex.: Fuchs: Fuchs Renolin CLP 460*, Aral Degol BG 460, BP Energol GR-XP 460, Esso Spartan EP 460, Mobil Gear 634, Tribol 1100/460, (Shell Tivela Oil WB)	1	Viscositate: 460/s40°C (220/s40°C) Ponto Pour: -20°C (-40°C) Ponto de inflamação: +265°C (+320°C) p. ex.: Fuchs: Fuchs Renolin CLP 460*, Aral Degol BG 460, BP Energol GR-XP 460, Esso Spartan EP 460, Mobil Gear 634, Tribol 1100/460, (Shell Tivela Oil WB)
2	Base de saponification : lithium + MoS ₂ Temp. de goteo : aprox. 185°C Coeficiente de penetración: 310 hasta 340 Temp. de trabajo : -20° hasta +120° C p. ex.: Aralub PMD1*, BP Mehrzweck-fett L21M, Esso Mehrzweckfett M, Mobilin SHC 460, Shell Retinax AM, STABYL L-TS 1 Mo	2	Carbonato sodico: Lithium + MoS ₂ Temp. di scorrimento: ca. 185°C Resistenza di penetrazione: 310-340 Temp. di esercizio: -20° fino a +120°C p. ex.: Aralub PMD1*, BP Mehrzweck-fett L21M, Esso Mehrzweckfett M, Mobilin SHC 460, Shell Retinax AM, STABYL L-TS 1 Mo
3	Base de saponification : synthetik (lithio) Temp. de goteo : aprox. 150° C Coeficiente de penetración : 400 hasta 430 Temp. de trabajo : -20° hasta +80° C p. ex.: Aralub FDP00, BP Energ grease HT-00 EP Esso Geriebefeisfett, Shell Spezial Geriebefeisfett H*, Mobilux Fieisfett EP 004, (Tivela Compound A)	3	Zeebasis: Synthetik (Lithium) Vloeipunt: ca. 150°C Walkpenetratie: 400-430 (400-430) Bedrijfstemperatuur: -20°tot +80°C b.v.: Aralub PMD1*, BP Mehrzweck-fett L21M, Esso Mehrzweckfett M, Mobilin SHC 460, Shell Retinax AM, STABYL L-TS 1 Mo

A Posição do ponto de lubrificação

B Tipo de lubrificante

- ◆ Massa
- Óleo

C Marcação

D Quantidade de lubrificante

E: Característica, fabricação

1	Viscositate: 460/s40°C (220/s40°C) Ponto Pour: -20°C (-40°C) Ponto de inflamação: +265°C (+320°C) p. ex.: Fuchs: Fuchs Renolin CLP 460*, Aral Degol BG 460, BP Energol GR-XP 460, Esso Spartan EP 460, Mobil Gear 634, Tribol 1100/460, (Shell Tivela Oil WB)	1	Viscosità: 460/s40°C (220/s40°C) Pourpoint: -20°C (-40°C) Punto d'inflammabilità: +265°C (+320°C) p. ex.: Fuchs: Fuchs Renolin CLP 460*, Aral Degol BG 460, BP Energol GR-XP 460, Esso Spartan EP 460, Mobil Gear 634, Tribol 1100/460, (Shell Tivela Oil WB)
2	Base de sabão: Lítio MoS ₂ Ponto de goteamento: aprox. 185°C Penetração Walk: 310-340 Temperatura operacional: -20°C até +120°C p. ex.: Aralub PMD1*, BP Mehrzweck-fett L21M, Esso Mehrzweckfett M, Mobilin SHC 460, Shell Retinax AM, STABYL L-TS 1 Mo	2	Carbonato sodico: Lithium + MoS ₂ Temp. di scorrimento: ca. 185°C Resistenza di penetrazione: 310-340 Temp. di esercizio: -20° fino a +120°C p. ex.: Aralub PMD1*, BP Mehrzweck-fett L21M, Esso Mehrzweckfett M, Mobilin SHC 460, Shell Retinax AM, STABYL L-TS 1 Mo
3	Base de sabão: Synthetik (Lítio) Temp. de goteamento: aprox. 150°C Penetração Walk: 400-430 (400-430) Temp. operacional: -20°C até -80°C p. ex.: Aralub FDP00, BP Energ grease HT-00 EP Esso Geriebefeisfett, Shell Spezial Geriebefeisfett H*, Mobilux Fieisfett EP 004, (Tivela Compound A)	3	Zeebasis: Synthetik (Lithium) Vloeipunt: ca. 150°C Walkpenetratie: 400-430 (400-430) Bedrijfstemperatuur: -20°tot +80°C b.v.: Aralub FDP00, BP Energ grease HT-00 EP Esso Geriebefeisfett, Shell Spezial Geriebefeisfett H*, Mobilux Fieisfett EP 004, (Tivela Compound A)

A Positie van smeerpunten

B Smeermiddel

- ◆ Vet
- Olie

C Aanduiding

D Hoeveelheid

E: Eigenschappen, merk

1	Viscositeit: 460/s40°C (220/s40°C) Vloeipunt: -20°C (-40°C) Vlampunt: +265°C (+320°C) b.v.: Fuchs Renolin CLP 460*, Aral Degol BG 460, BP Energol GR-XP 460, Esso Spartan EP 460, Mobil Gear 634, Tribol 1100/460, (Shell Tivela Oil WB)	1	Viscosità: 460/s40°C (220/s40°C) Vloeipunt: -20°C (-40°C) Vlampunt: +265°C (+320°C) b.v.: Fuchs Renolin CLP 460*, Aral Degol BG 460, BP Energol GR-XP 460, Esso Spartan EP 460, Mobil Gear 634, Tribol 1100/460, (Shell Tivela Oil WB)
2	Zeebasis: Lithium + MoS ₂ Vloeipunt: ca. 185°C Walkpenetratie: 310-340 Bedrijfstemperatuur: -20°tot +120°C p. ex.: Aralub PMD1*, BP Mehrzweck-fett L21M, Esso Mehrzweckfett M, Mobilin SHC 460, Shell Retinax AM, STABYL L-TS 1 Mo	2	Carbonato sodico: Lithium + MoS ₂ Temp. di scorrimento: ca. 185°C Resistenza di penetrazione: 310-340 Temp. di esercizio: -20° fino a +120°C p. ex.: Aralub PMD1*, BP Mehrzweck-fett L21M, Esso Mehrzweckfett M, Mobilin SHC 460, Shell Retinax AM, STABYL L-TS 1 Mo
3	Zeebasis: Synthetik (Lithium) Vloeipunt: ca. 150°C Walkpenetratie: 400-430 (400-430) Bedrijfstemperatuur: -20°tot +80°C b.v.: Aralub FDP00, BP Energ grease HT-00 EP Esso Geriebefeisfett, Shell Spezial Geriebefeisfett H*, Mobilux Fieisfett EP 004, (Tivela Compound A)	3	Zeebasis: Synthetik (Lithium) Vloeipunt: ca. 150°C Walkpenetratie: 400-430 (400-430) Bedrijfstemperatuur: -20°tot +80°C b.v.: Aralub FDP00, BP Energ grease HT-00 EP Esso Geriebefeisfett, Shell Spezial Geriebefeisfett H*, Mobilux Fieisfett EP 004, (Tivela Compound A)

Technische Daten

E: Charakteristik, Fabrikat (Fortsetzung)

4 Seifenbasis: Lithium + MoS2 (Synthetik + Lithium)
Tropfpunkt: ca. +180°C
Waldpenetration: 355-385 (400-430)
Betriebs Temperatur: -30° bis +120°C (-35° bis +130°C)
z.B.: Aralub LZ 0, Renolit FLM 0*, Tribol Mobilub-Aloy MPG 00, (Tiela Compound A)

5 Seifenbasis: Lithium
Tropfpunkt: ca. +170°C (-280°)
Waldpenetration: 220-250 (265-290)
Betriebs Temperatur: -20° bis +120°C (-40° bis +120°C)
z.B.: Aralub HL3, BP Energ grease RBB3, ESSO Wälzlagerfett Andak C AC 205, Mobilux 3* (Mobil Mobilgrease 28)

‡ (Schmiermittelangabe für tiefe Einsatztemperaturen, -40 ... +40°C)
* Werksfüllung
*1 Nur bis -20°C

Technical data

E: Characteristics, makes (cont.)

4 Soap base: Lithium + MoS2 (Synthetic + Lithium)
Dripping point: approx. +180°C
Penetration: 355-385 (400-430)
Operating temp.: -30° to +120°C (-35° to +130°C)
e.g.: Aralub LZ 0, Renolit FLM 0*, Tribol Mobilub-Aloy MPG 00, (Tiela Compound A)

5 Soap base: Lithium
Dripping point: approx. 170°C (280°)
Penetration: 220-250 (265-290)
Operating temp.: -20° to +120°C (-40° to +120°C)
e.g.: Aralub HL3, BP Energ grease RBB3, ESSO Wälzlagerfett Andak C AC 205, Mobilux 3* (Mobil Mobilgrease 28)

‡ (Lubricants for low operating temperatures, -40 ... +40°C)
* Factory filling
*1 Only down to -20°C

Caractéristiques techniques

E: Caractéristiques, marque (suite)

4 Base de saponification : lithium + MoS2 (Synthetik + Lithium)
Point de goutte : environ + 180° C
Pénétration par fouillage : 355 à 385 (400 à 430)
Temp. de fonctionnem. : - 30° à + 130° C (- 35° à + 130° C)
p. ex.: Aralub LZ 0, Renolit FLM 0*, Tribol Mobilub-Aloy MPG 00, (Tiela Compound A)

5 Base de saponification : lithium
Point de goutte : environ 170° C
Pénétration par fouillage : 220 à 250 (265 à 290)
Temp. de fonctionnement : - 20° à + 120° C (- 40° à + 120° C)
p. ex.: Aralub HL3, BP Energ grease RBB3, ESSO Wälzlagerfett Andak C AC 205, Mobilux 3* (Mobil Mobilgrease 28)

‡ (Lubrifiant préconisé pour basses températures d'utilisation, -40 ... +40°C)
* Remplissage en usine
*1 Seulement jusqu'à -20°C

Datos técnicos

E: Características, marcas (continuación)

4 Base : litio + MoS2 (Synthetik + Lithium)
Temp. de goteo : aprox. + 180° C
Coeficiente de penetración : 355 hasta 385 (400 hasta 430)
Temp. de abap. : - 30° hasta + 130° C (- 35° a + 130° C)
p. ej.: Aralub LZ 0, Renolit FLM 0*, Tribol Mobilub-Aloy MPG 00, (Tiela Compound A)

5 Base : litio
Temp. de goteo : aprox. 170° C
Coeficiente de penetración : 220 hasta 250 (265 hasta 290)
Temp. de trabajo : - 20° hasta + 120° C (- 40° a + 120° C)
p. ej.: Aralub HL3, BP Energ grease RBB3, ESSO Wälzlagerfett Andak C AC 205, Mobilux 3* (Mobil Mobilgrease 28)

‡ (Indicación sobre el lubricante para bajas temperaturas de operación, -40 ... +40°C)
* llenado de fábrica
*1 Sólo hasta -20°C

Dados técnicos

E: Característica, fabricação (continuação)

4 Base de sabão: Lítio + MoS2 (Synthetik + Lithium)
Ponto de gotejamento: aprox. +180°C
Penetração Walk: 355-385 (400-430)
Temp. de operação: -30°C até +130°C (-35° a +130° C)
p.ex.: Aralub LZ 0, Renolit FLM 0*, Tribol Mobilub-Aloy MPG 00, (Tiela Compound A)

5 Base de sabão: Lítio
Ponto de gotejamento: aprox. 170°C
Penetração Walk: 220-250 (265-290)
Temp. operacional: -20°C até +120°C (-40°C até +120°C)
p.ex.: Aralub HL3, BP Energ grease RBB3, ESSO Wälzlagerfett Andak C AC 205, Mobilux 3* (Mobil Mobilgrease 28)

‡ (lubrificante para baixas temperaturas de operação, -40 ... +40°C)
* enchimento de fábrica
*1 sómente até -20C

Dati tecnici

E: Caratteristiche, tipi consigliati (seguito)

4 Carbonato sodico: Lithium + MoS2 (Synthetik + Lithium)
Temp. di scorrimento: ca. +180°C
Resistenza penetrazione: 355-385 (400-430)
Temp. di esercizio: -30° fino a +130°C (-35° a +130° C)
p.ej.: Aralub LZ 0, Renolit FLM 0*, Tribol Mobilub-Aloy MPG 00, (Tiela Compound A)

5 Carbonato sodico: Lithium
Temp. di scorrimento: ca 170°C
Resistenza pene-trazione: 220-250 (265-290)
Temp. di esercizio: -20° fino a +120°C (-40° fino a +120° C)
p.es.: Aralub HL3, BP Energ grease RBB3, ESSO Wälzlagerfett Andak C AC 205, Mobilux 3* (Mobil Mobilgrease 28)

‡ (indicazione del tipo di lubrificanti per basse temperature d'esercizio, -40 ... +40°C)
* Riempimento effettuato dal costruttore
*1 Solo fino a -20°C

Technische gegevens

E: Eigenschappen, merk (vervolgd)

4 Zeepbasis: Lithium + MoS2 (Synthetik + Lithium)
Vloeipunt: ca. +180°C
Waldpenetratie: 355-385 (400-430)
Bedrijfstemperatuur: -30° tot +130°C (-35° tot +130° C)
b.v.: Aralub LZ 0, Renolit FLM 0*, Tribol Mobilub-Aloy MPG 00, (Tiela Compound A)

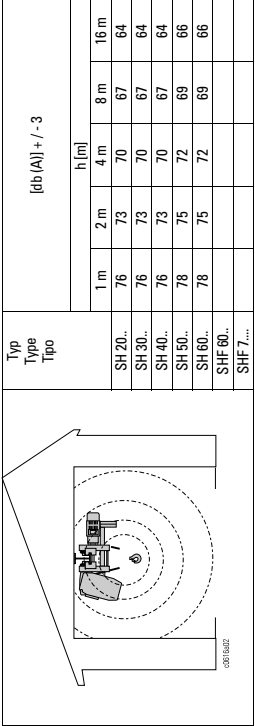
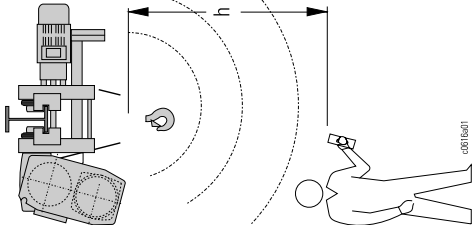
5 Zeepbasis: Lithium
Vloeipunt ca 170°C
Waldpenetratie: 220-250 (265-290)
Bedrijfstemperatuur: -20° tot +120°C (-40° tot +120° C)
b.v.: Aralub HL3, BP Energ grease RBB3, ESSO Wälzlagerfett Andak C AC 205, Mobilux 3* (Mobil Mobilgrease 28)

‡ (smeermiddelen voor lage bedrijfstemperaturen, -40 ... +40°C)
* door fabrikant gevuld
*1 alleen tot -20°C

Schalldruckpegel

Gemessen wurde in 1 m Abstand vom Seilzug. Der gemittelte Schall-druckpegel ist für ein Arbeitsspiel (50% mit Nennlast, 50% ohne Last).

Anstelle der Angabe eines arbeitsplatzbezogenen Emissions-wertes, können die Werte aus Ta-belle 1 und 2 bei Messabstand "h" verwendet werden.



Noise level

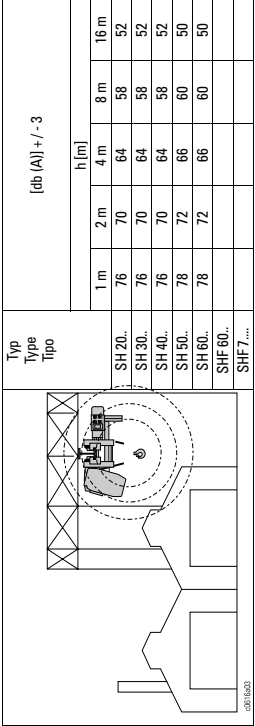
The noise level was measured at a distance of 1 m from the wire rope hoist. The mean noise level is calculated for one operating cycle (50% with nominal load, 50% without load).

Instead of stating an emission value based on a workplace, the values from table 1 and 2 at measuring distance "h" can be used.

Niveau de pression acoustique

La mesure a été effectuée à 1 m de distance du palan. Le niveau de pression acoustique est déterminé pour un cycle (50 % avec charge nominale, 50 % sans charge).

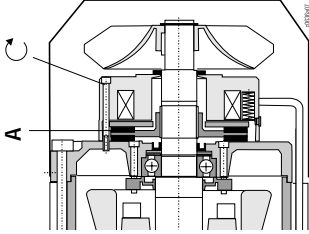
Au lieu d'indiquer un facteur de nuisance propre au poste de travail, il est possible d'utiliser les valeurs figurant dans les tableaux 1 et 2, avec une distance de mesure "h".



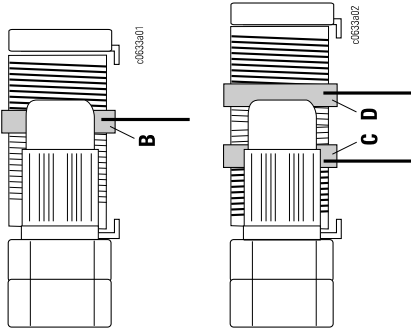
Stromlaufpläne siehe Seilzug-
dokumentation

See wire rope hoist documentation
for circuit diagrams

Pour schémas des connexions voir
documentation du palan à câble



*1	*2	*3	↻	A
				#
SH 30..	12/2H33	M16	9 Nm	567 109 0
	12/2H42	M32	9 Nm	567 092 0
SH 40..	12/2H42	M32	9 Nm	567 092 0
	12/2H62	M60	22 Nm	567 093 0
SH 50..	12/2H71	M100	22 Nm	567 118 0
	12/2H72	M150	22 Nm	567 119 0
	12/2H72	M150	22 Nm	567 119 0
	12/2H73	M150	22 Nm	567 808 0
SH 60..	24/4H92	M500	45 Nm	567 224 0
SHF7...				



*1	B	C	D
	#	#	#
SH 30			
SH 30	03 430 02 43 0	03 430 01 43 0	03 430 00 43 0
SH 40			
SH 40	04 430 00 43 0	04 430 02 43 0	04 430 01 43 0
SH 50			
SH 50	05 430 01 43 0	05 430 02 43 0	05 430 00 43 0
SH 60			
SH 60	06 430 03 43 0	06 430 04 43 0	06 430 00 43 0
SHF7...			
SHF7...			

- A Bremsscheibe (Hubmotor)
B Seilführungsring (Linksgewinde)
C Seilführungsring (Rechtsgewinde)
D Seilführungsring (Linksgewinde)
E Drahtseil (Seillänge und -nummer siehe Datenblatt)
F Bremsscheibe (Fahrmotor SF 17..)
- A Brake disc (hoist motor)
B Rope guide (left-hand thread)
C Rope guide (right-hand thread)
D Rope guide (left-hand thread)
E Wire rope (see data sheet for rope length and number)
F Brake disk (travel motor SF 17..)
- A Disque de frein
B Bague guide-câble (filetage à gauche)
C Bague guide-câble (filetage à droite)
D Bague guide-câble (filetage à gauche)
E Câble (pour la longueur et le numéro du câble, voir fiche technique)
F Disque de frein (SF 17..)

- # Bestell-Nr.
* Auf Anfrage
*1 Seilzugtyp
*2 Hubmotortyp
*3 Typ der Hubmotorbremse
*4 Fahrmotortyp
*5 Typ der Fahrmotorbremse

- # Order No.
* On request
*1 Wire rope hoist type
*2 Hoist motor type
*3 Hoist brake type
*4 Travel motor type
*5 Travel motor brake type


- # No. de commande
* Sur demande
*1 Type de palan
*2 Type de moteur de levage
*3 Type de frein du palan
*4 Type de moteur de translation
*5 Type de frein de moteur de translation


Austausch und Reparatur nur von
Fachkräften ausführen lassen!


Replacement and repairs only by
skilled personnel


Remplacement et réparation
seulement par une personne qualifiée

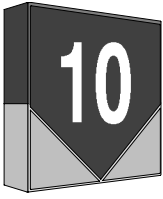
9.3 CABLES CERTIFICATES

 DEMAG Cranes & Components	Werksbescheinigung Drahtseile Test certificate for wire ropes Certificat d'essais pour câbles métalliques	1 Seite(n)	Seite 1
		Identnr.: 23531944	Klass.-Nr.: 787 115
		Ausgabe 0402	XB
Diese Werksbescheinigung entspricht DIN EN 10204 - 2.1 This certificate of compliance with the order corresponds to DIN EN 10204 - 2.1 Ce attestation de conformité à la commande correspond à DIN EN 10204 - 2.1			
Auftragsnr.: 356319 Order-No. No. de commande		Hersteller/Bevollmächtigter: Demag Manufacturer/Authorized distributor Fabricant/Fondé de pouvoir Cranes & Components GmbH	
Kunden-Bestellnr.: 10233142 Purchaser's order no. Réf de l'acheteur		Besteller: Demag Cranes & Components Purchaser Acheteur 5, Avenue Ampere 51012 CHALONS-EN-CHAMPAGNE Frankreich	
Identnr. des Drahtseils: 70270945 Identnr of the wire rope/Identnr de câble métallique			
Länge des Drahtseils (m) : 45 Length of the wire rope/Longueur de câble métallique			
Nenn-Durchmesser des Seiles (mm) : 9 Diameter of rope/Diamètre du câble			
Konstruktion des Seiles : 8X19W+SES Construction of rope/Construction du câble métallique			
Konstruktion der Einlage : 8X7+1X19 Construction of cores/Nature de l'âme			
Nennfestigkeit (N/mm²) : 1960 Nominal strength/Résistance nominale			
Rechnerische Gesamtbruchkraft (kN) : 71,6 Calculated total breaking force Charge de rupture totale calculée			
Mindestbruchkraft (kN) : 63 Minimum breaking Force / Force de rupture minimum			
Schlagart : Kreuzschlag links Lay/Type de commettage			
Vorgeformt : NEIN Preformed/Préformé			
Material der Drähte : Kohlenstoffstahl Wire material/Matériau des câbles métalliques			
Längengewicht (kg/m) : 0,36 Weight per unit length/Poids par unité de longueur			
Oberfläche der Drähte : BLANK Outer surface of wires/Surface des fils			
Bemerkungen: Alum. Pressverb. / Alum. Press Fit Remarks Remarques			
Diese Werksbescheinigung ist durch die EDV erstellt worden. Sie ist ohne Unterschrift gültig. This test certificate is issued by EDP. It is effective without signature. / Ce certificat d'essai est établi par ordinateur. Il est valable sans signature.			
Datum: 7. März 2011 Date Date		Qualitätssicherung Abteilung: H. Wiesmann Quality assurance department Service d'assurance de qualité	

 DEMAG Cranes & Components	Werksbescheinigung Drahtseile Test certificate for wire ropes Certificat d'essais pour câbles métalliques		1 Seite(n)	Seite 1
			Identnr.: 23531944	Klass.-Nr.: 787 115
	Ausgabe 0402		XB	
Diese Werksbescheinigung entspricht DIN EN 10204 - 2.1 This certificate of compliance with the order corresponds to DIN EN 10204 - 2.1 Ce attestation de conformité à la commande correspond à DIN EN 10204 - 2.1				
Auftragsnr.: Order-No. No. de commande		356386		
Hersteller/Bevollmächtigter: Manufacturer/Authorized distributor Fabricant/Fondé de pouvoir		Demag Cranes & Components GmbH		
Kunden-Bestellnr.: Purchaser's order no. Réf de l'acheteur		10233159		
Besteller: Purchaser Acheteur		Demag Cranes & Components 5,Avenue Ampere 51012 CHALONS-EN-CHAMPAGNE Frankreich		
Identnr. des Drahtseils: Identnr of the wire rope/Identnr de câble métallique				
70270945				
Länge des Drahtseils (m) : Length of the wire rope/Longueur de câble métallique				
45				
Nenn-Durchmesser des Seiles (mm) : Diameter of rope/ Diamètre du câble				
9				
Konstruktion des Seiles : Construction of rope/Construction du câble métallique				
8X19W+SES				
Konstruktion der Einlage : Construction of cores/Nature de l'âme				
8X7+1X19				
Nennfestigkeit (N/mm²) : Nominal strength/Résistance nominale				
1960				
Rechnerische Gesamtbruchkraft (kN) : Calculated total breaking force Charge de rupture totale calculée				
71,6				
Mindestbruchkraft (kN) : Minimum breaking Force / Force de rupture minimum				
63				
Schlagart : Lay/Type de commettage				
Kreuzschlag links				
Vorgeformt : Preformed/Préformé				
NEIN				
Material der Drähte : Wire material/Matériau des câbles métalliques				
Kohlenstoffstahl				
Längengewicht (kg/m) : Weight per unit length/Poids par unité de longueur				
0,36				
Oberfläche der Drähte : Outer surface of wires/Surface des fils				
BLANK				
Bemerkungen: Alum. Pressverb. / Alum. Press Fit Remarks Remarques				
Diese Werksbescheinigung ist durch die EDV erstellt worden. Sie ist ohne Unterschrift gültig. This test certificate is issued by EDP. It is effective without signature. / Ce certificat d'essai est établi par ordinateur. Il est valable sans signature.				
Datum: 7. März 2011 Date Date		Qualitätssicherung Abteilung: H. Wiesmann Quality assurance department Service d'assurance de qualité		

 DEMAG Cranes & Components	Werksbescheinigung Drahtseile Test certificate for wire ropes Certificat d'essais pour câbles métalliques	1 Seite(n)	Seite 1
		Identnr.: 23531944	Klass.-Nr.: 787 115
		Ausgabe 0402	XB
Diese Werksbescheinigung entspricht DIN EN 10204 - 2.1 This certificate of compliance with the order corresponds to DIN EN 10204 - 2.1 Ce attestation de conformité à la commande correspond à DIN EN 10204 - 2.1			
Auftragsnr.: Order-No. 356353 No. de commande		Hersteller/Bevollmächtigter: Manufacturer/Authorized distributor Fabricant/Fondé de pouvoir Demag Cranes & Components GmbH	
Kunden-Bestellnr.: 10233158 Purchaser's order no. Réf de l'acheteur		Besteller: Demag Cranes & Components Purchaser Acheteur 5,Avenue Ampere 51012 CHALONS-EN-CHAMPAGNE Frankreich	
Identnr. des Drahtseils: Identnr of the wire rope/Identnr de câble métallique 70270945			
Länge des Drahtseils (m) : Length of the wire rope/Longueur de câble métallique 45			
Nenn-Durchmesser des Seiles (mm) : Diameter of rope/ Diamètre du câble 9			
Konstruktion des Seiles : Construction of rope/Construction du câble métallique 8X19W+SES			
Konstruktion der Einlage : Construction of cores/Nature de l'âme 8X7+1X19			
Nennfestigkeit (N/mm²) : Nominal strength/Résistance nominale 1960			
Rechnerische Gesamtbruchkraft (kN) : Calculated total breaking force Charge de rupture totale calculée 71,6			
Mindestbruchkraft (kN) : Minimum breaking Force / Force de rupture minimum 63			
Schlagart : Lay/Type de commettage Kreuzschlag links			
Vorgeformt : Preformed/Préformé NEIN			
Material der Drähte : Wire material/Matériau des câbles métalliques Kohlenstoffstahl			
Längengewicht (kg/m) : Weight per unit length/Poids par unité de longueur 0,36			
Oberfläche der Drähte : Outer surface of wires/Surface des fils BLANK			
Bemerkungen: Alum. Pressverb. / Alum. Press Fit Remarks Remarques			
Diese Werksbescheinigung ist durch die EDV erstellt worden. Sie ist ohne Unterschrift gültig. This test certificate is issued by EDP. It is effective without signature. / Ce certificat d'essai est établi par ordinateur. Il est valable sans signature.			
Datum: 7. März 2011 Date Date		Qualitätssicherung Abteilung: H. Wiesmann Quality assurance department Service d'assurance de qualité	

 DEMAG <i>Cranes & Components</i>	Werksbescheinigung Drahtseile Test certificate for wire ropes Certificat d'essais pour câbles métalliques	1 Seite(n)	Seite 1
		Identnr.: 23531944	Klass.-Nr.: 787 115
		Ausgabe 0402	XB
Diese Werksbescheinigung entspricht DIN EN 10204 - 2.1 This certificate of compliance with the order corresponds to DIN EN 10204 - 2.1 Ce attestation de conformité à la commande correspond à DIN EN 10204 - 2.1			
Auftragsnr.: Order-No. 356390 No. de commande		Hersteller/Bevollmächtigter: Manufacturer/Authorized distributor Fabricant/Fondé de pouvoir Demag Cranes & Components GmbH	
Kunden-Bestellnr.: Purchaser's order no. 10233165 Réf de l'acheteur		Besteller: Purchaser Acheteur Demag Cranes & Components 5,Avenue Ampere 51012 CHALONS-EN-CHAMPAGNE Frankreich	
Identnr. des Drahtseils: Identnr of the wire rope/Identnr de câble métallique 70270945			
Länge des Drahtseils (m) : Length of the wire rope/Longueur de câble métallique 45			
Nenn-Durchmesser des Seiles (mm) : Diameter of rope/ Diamètre du câble 9			
Konstruktion des Seiles : Construction of rope/Construction du câble métallique 8X19W+SES			
Konstruktion der Einlage : Construction of cores/Nature de l'âme 8X7+1X19			
Nennfestigkeit (N/mm²) : Nominal strength/Résistance nominale 1960			
Rechnerische Gesamtbruchkraft (kN) : Calculated total breaking force Charge de rupture totale calculée 71,6			
Mindestbruchkraft (kN) : Minimum breaking Force / Force de rupture minimum 63			
Schlagart : Lay/Type de commettage Kreuzschlag links			
Vorgeformt : Preformed/Préformé NEIN			
Material der Drähte : Wire material/Matériau des câbles métalliques Kohlenstoffstahl			
Längengewicht (kg/m) : Weight per unit length/Poids par unité de longueur 0,36			
Oberfläche der Drähte : Outer surface of wires/Surface des fils BLANK			
Bemerkungen: Alum. Pressverb. / Alum. Press Fit Remarks Remarques			
Diese Werksbescheinigung ist durch die EDV erstellt worden. Sie ist ohne Unterschrift gültig. This test certificate is issued by EDP. It is effective without signature. / Ce certificat d'essai est établi par ordinateur. Il est valable sans signature.			
Datum: 7. März 2011 Date Date		Qualitätssicherung Abteilung: H. Wiesmann Quality assurance department Service d'assurance de qualité	



VERIFICATION OF WELDS

CONTENTS OF THE CHAPTER

WELDS TO INSPECT	10.1-1
------------------------	--------



10.1 WELDS TO INSPECT

ECL code	Reference	Superior drawing code
0-04-450-72	HOOKING CLAMP FIXING	1-10-664-87
1-10-664-86	HOOKING CLAMP	1-11-033-15
1-10-664-88	FASTENER 653X340X340	1-10-664-87
1-10-672-86	EXTRACTING CLAMP BODY 220X220	1-10-672-86
1-10-696-32	EXTRACTING CLAMP CATCH	1-10-672-84
1-10-391-07	CROSS BEAM L.2130	1-10-848-10
1-10-084-46	BASKET 899X439X407	1-10-858-97
1-10-647-02	CLEVIS	1-10-858-97
1-10-647-14	PULLEY BLOCK FRAME	1-10-647-13
1-10-176-50	D.506 DRUM WINDING 34MT	1-10-895-08
1-10-173-01	COMPLETE MOVABLE FRAME N° 1	1-10-867-56
1-10-742-65	SHOVEL UPPER FORK	1-10-860-28
1-10-915-95	COMPLETE MOVABLE FRAME N° 2	1-10-867-56
1-10-196-14	LIFTING BEAM FORK 370X360X110	1-10-196-10
1-10-861-93	MOBIL FRAME	1-10-861-95

Maintenance period : Every 2 years**Visual inspection**

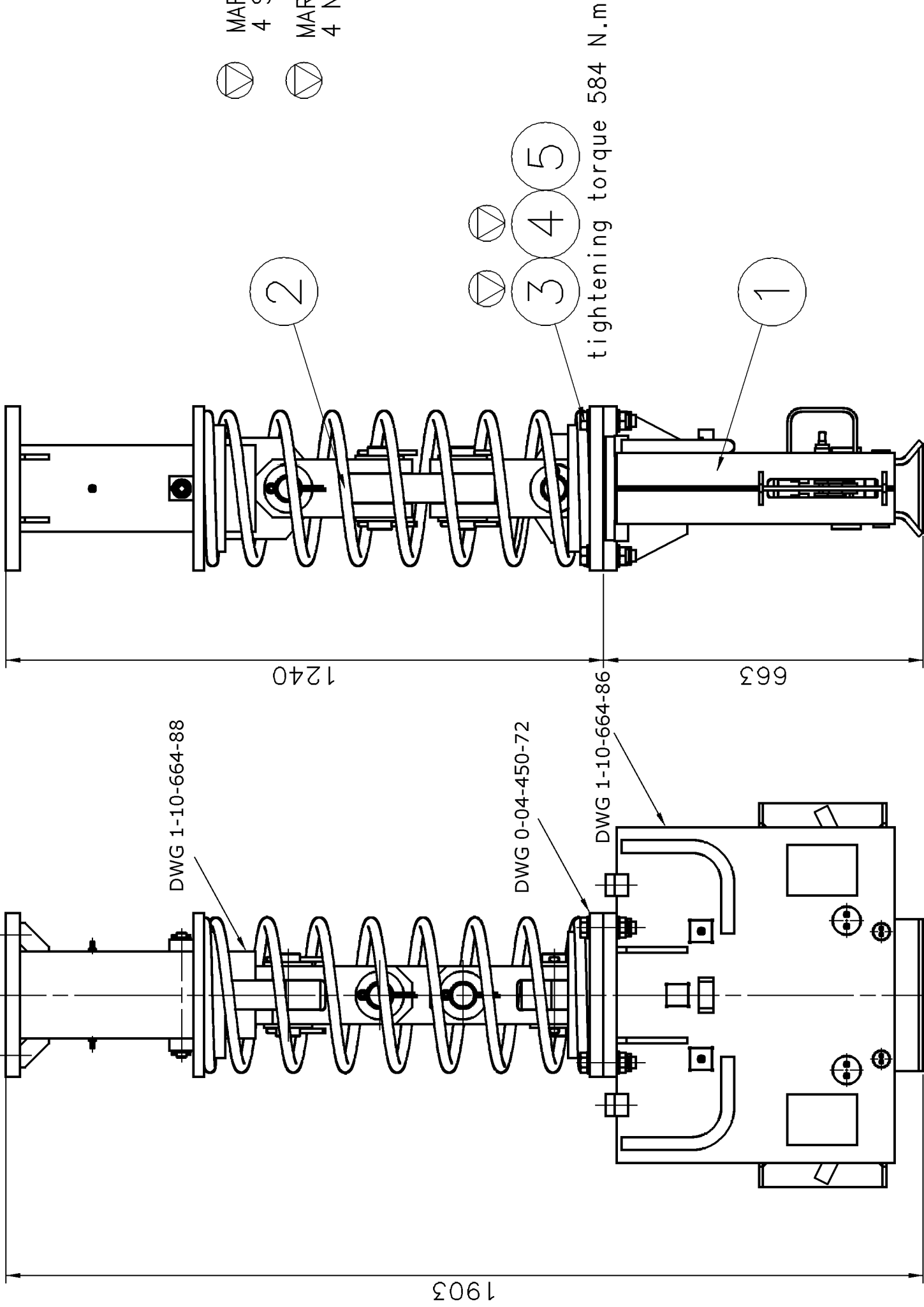
A B C D E F G H

4

3

2

1



MARK 3

4 SCREW HM24x100 10.9 ISO 4014



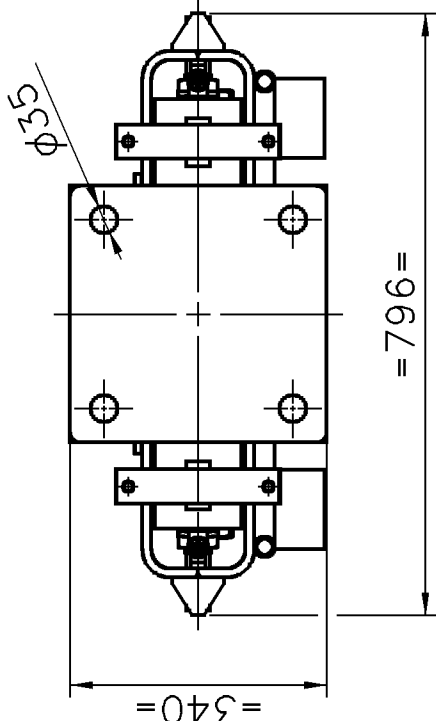
MARK 4

4 NUT H PREVAILING TORQUE DIN 980-V M24

PIECE DE SECURITE SOUMISE A VERIFICATION SAFETY PARTS TO BE CHECKED	
VERIFICATION 100% DES PIECES 100% OF PARTS MUST BE CHECKED	
2	NB de caractéristiques NB of characteristics marked
Toute modification d'une caractéristique sécurité doit faire l'objet d'une validation par le responsable produit ou expert. Any change of safety characteristics have to be validated by the product manager or expert.	

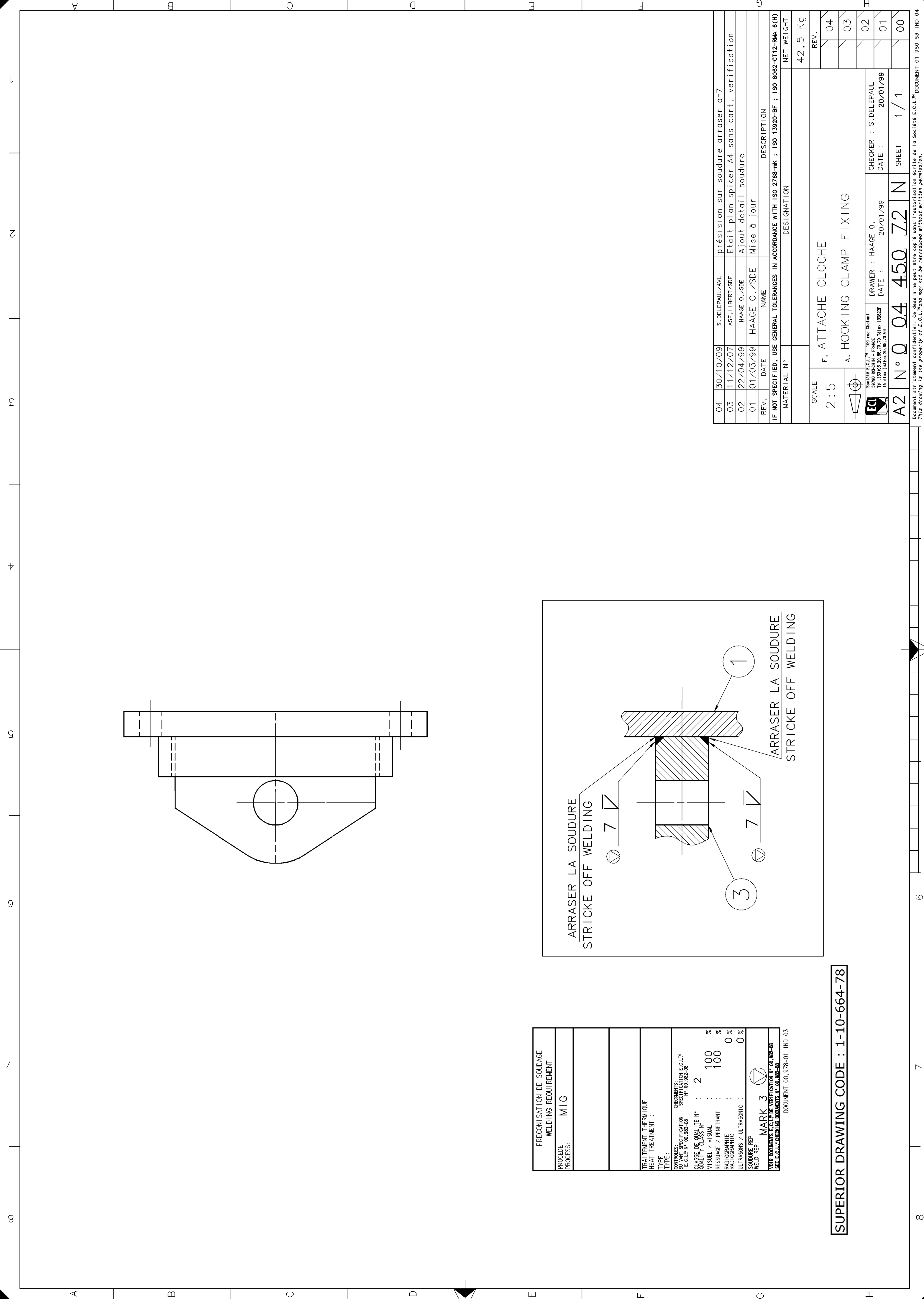
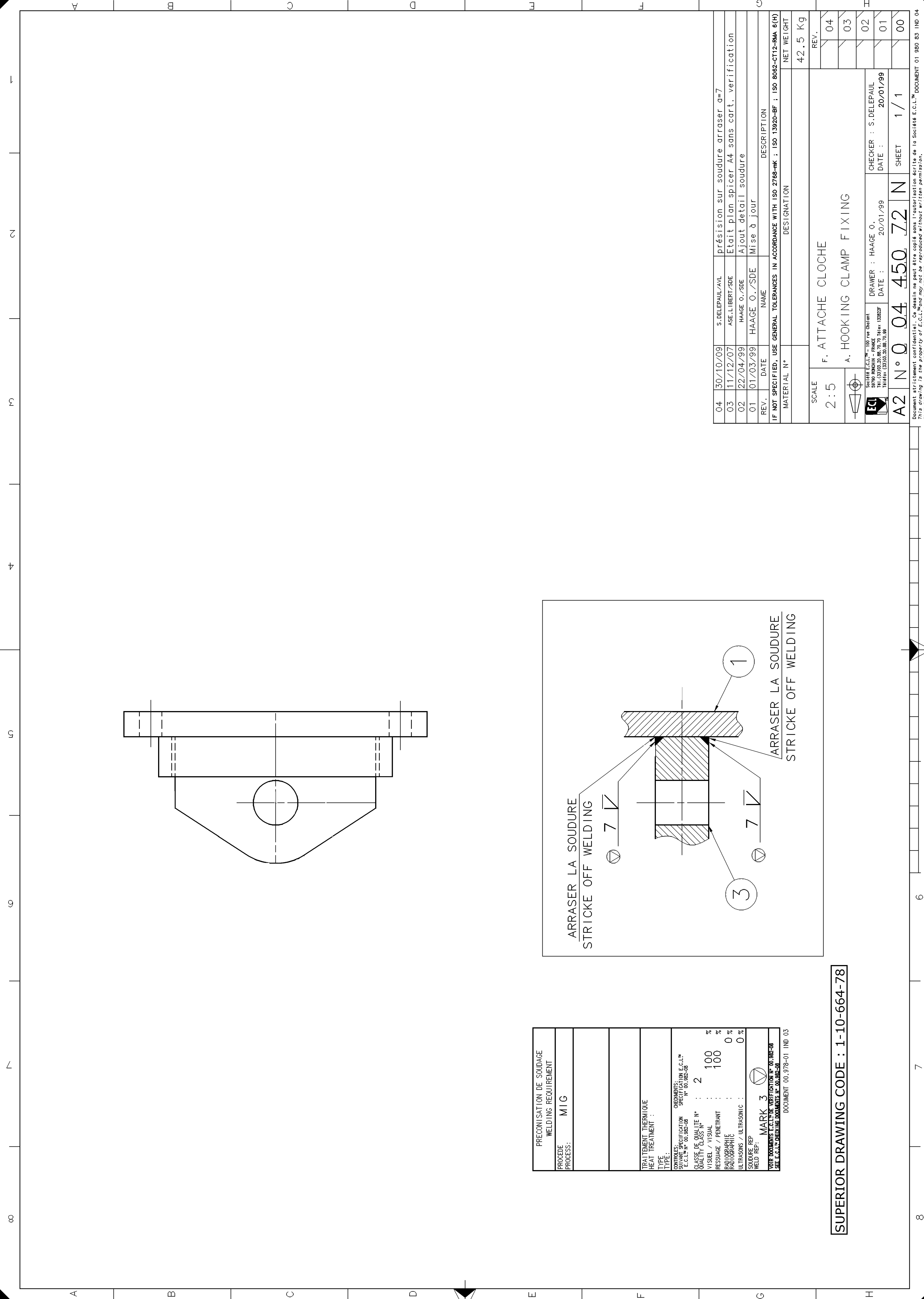
DOCUMENT 00.978-37 IND 07

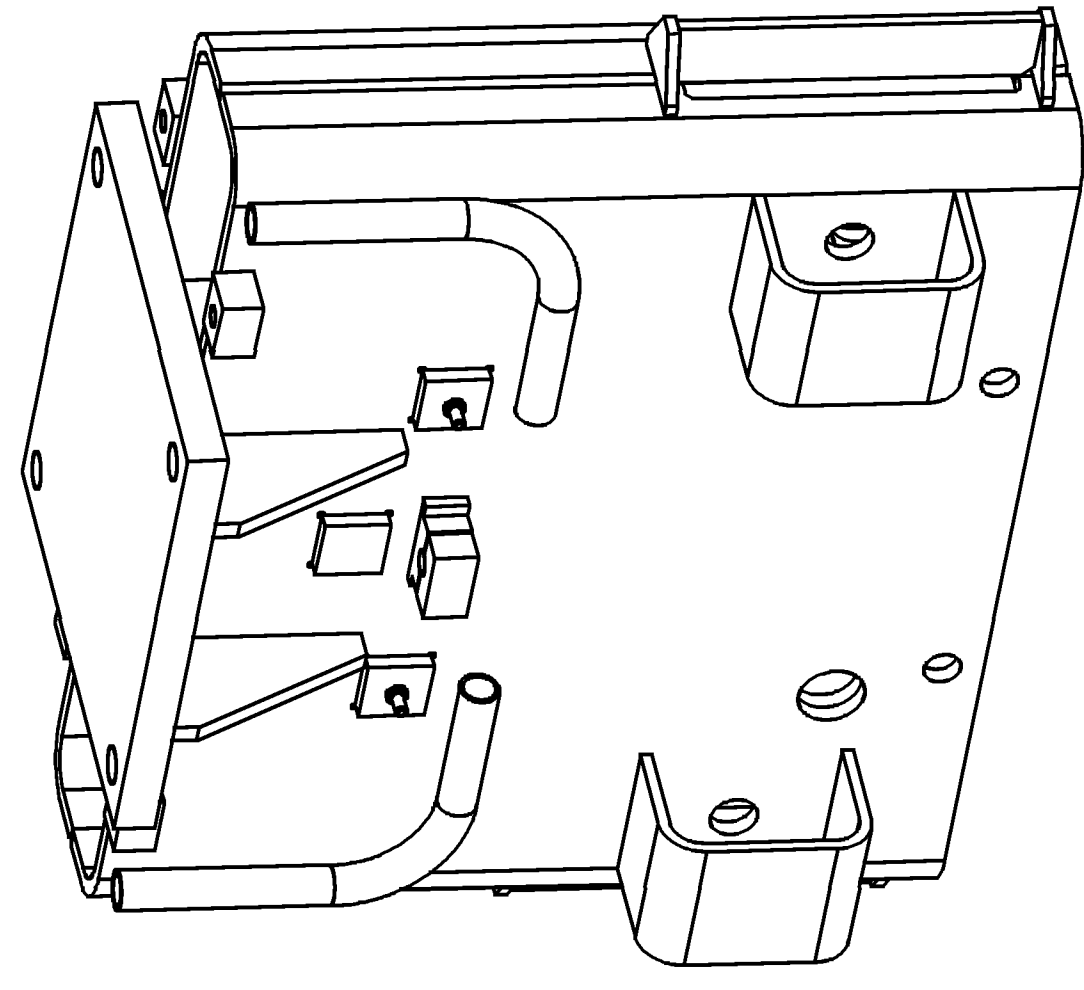
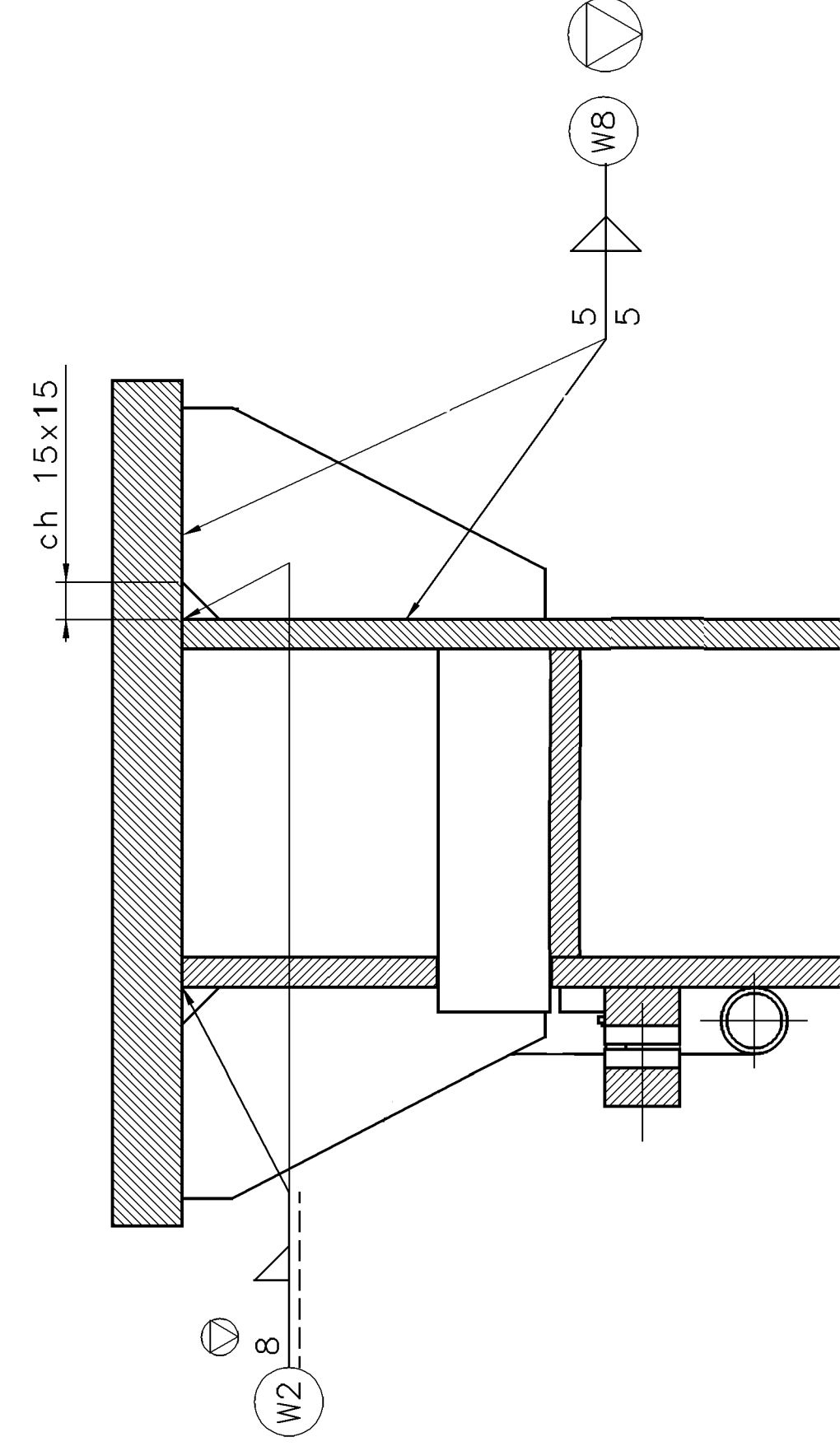
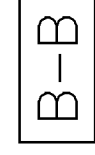
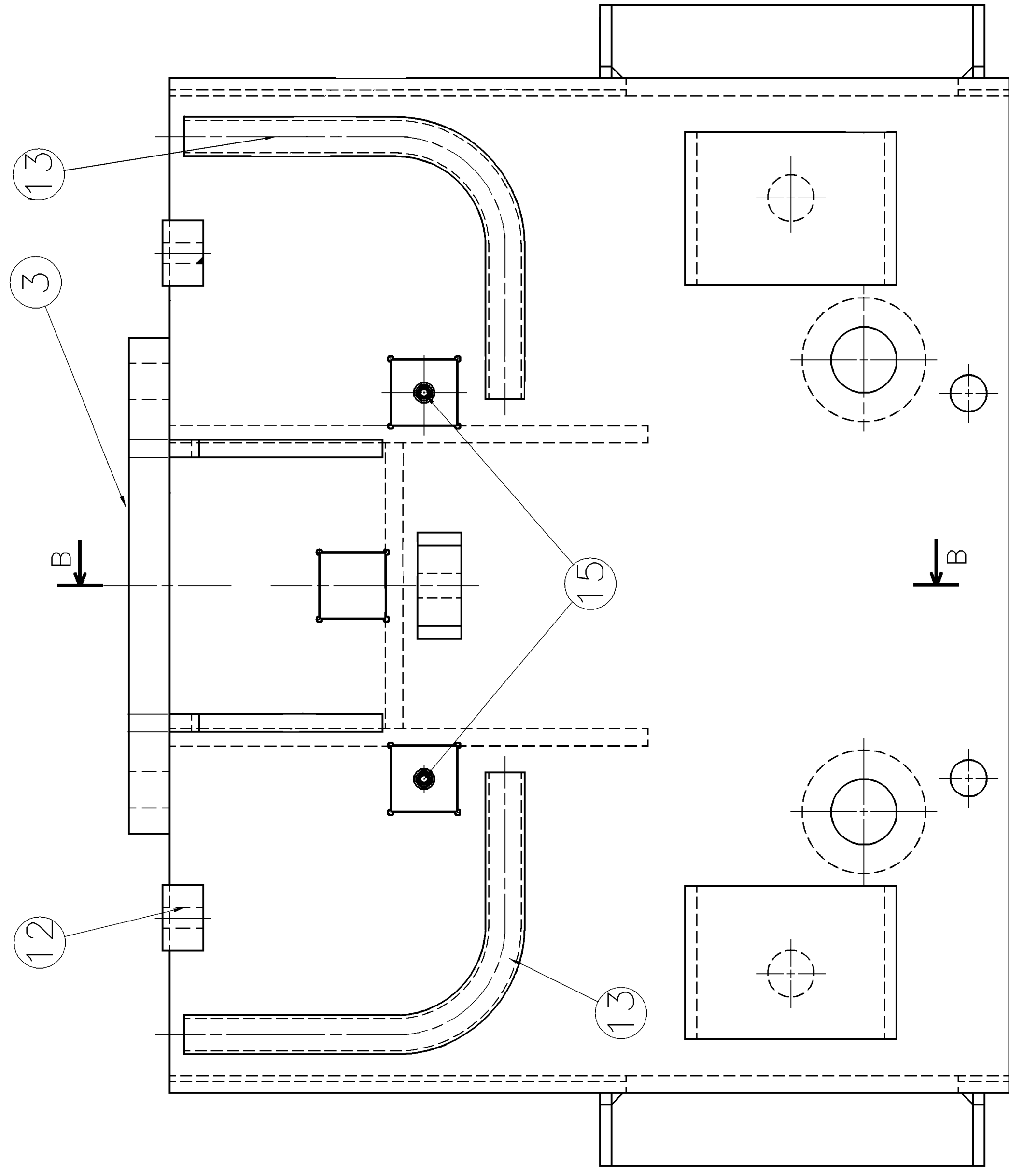
tightening torque 584 N.m





REV.	DATE	NAME	DESCRIPTION
IF NOT SPECIFIED, USE GENERAL TOLERANCES IN ACCORDANCE WITH ISO 2768-mK ; ISO 13920-BF ; ISO 8062-CT12-RMA 6(H)			
MATERIAL N°		DESIGNATION	
SCALE 1:10		REV.	
F. ENSEMBLE DE PREHENSION		NET WEIGHT 390 Kg	
A. HOOKING CLAMP ASS'Y		REV.	
DRAWER : PRO.DENIS DATE : 10/12/08		CHECKER : W.SZMIDT DATE : 12/12/08	
A3 N° 1 10 664 78 N		SHEET 1 / 1	
TIRE DE 1.10.183.84		00	

Document strictement confidentiel. Ce dessin ne peut être copié sans l'autorisation écrite de la Société E.C.L.™ DOCUMENT 01 980 84 IND 04
This drawing is the property of E.C.L.™ and may not be reproduced without written permission.
PLAN CAO - Ne pas modifier manuellement / CAD DRAWING - Do not change manually

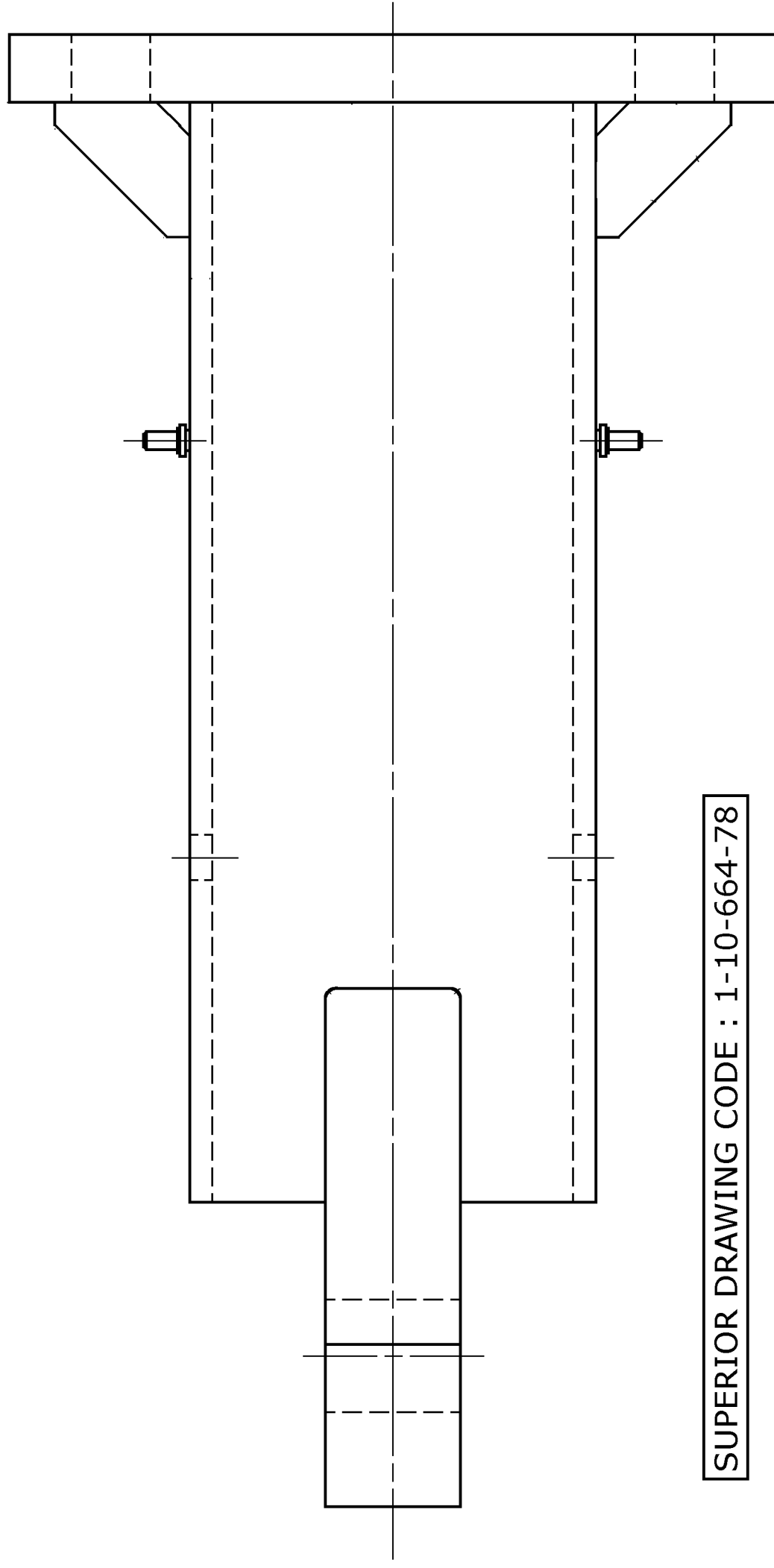
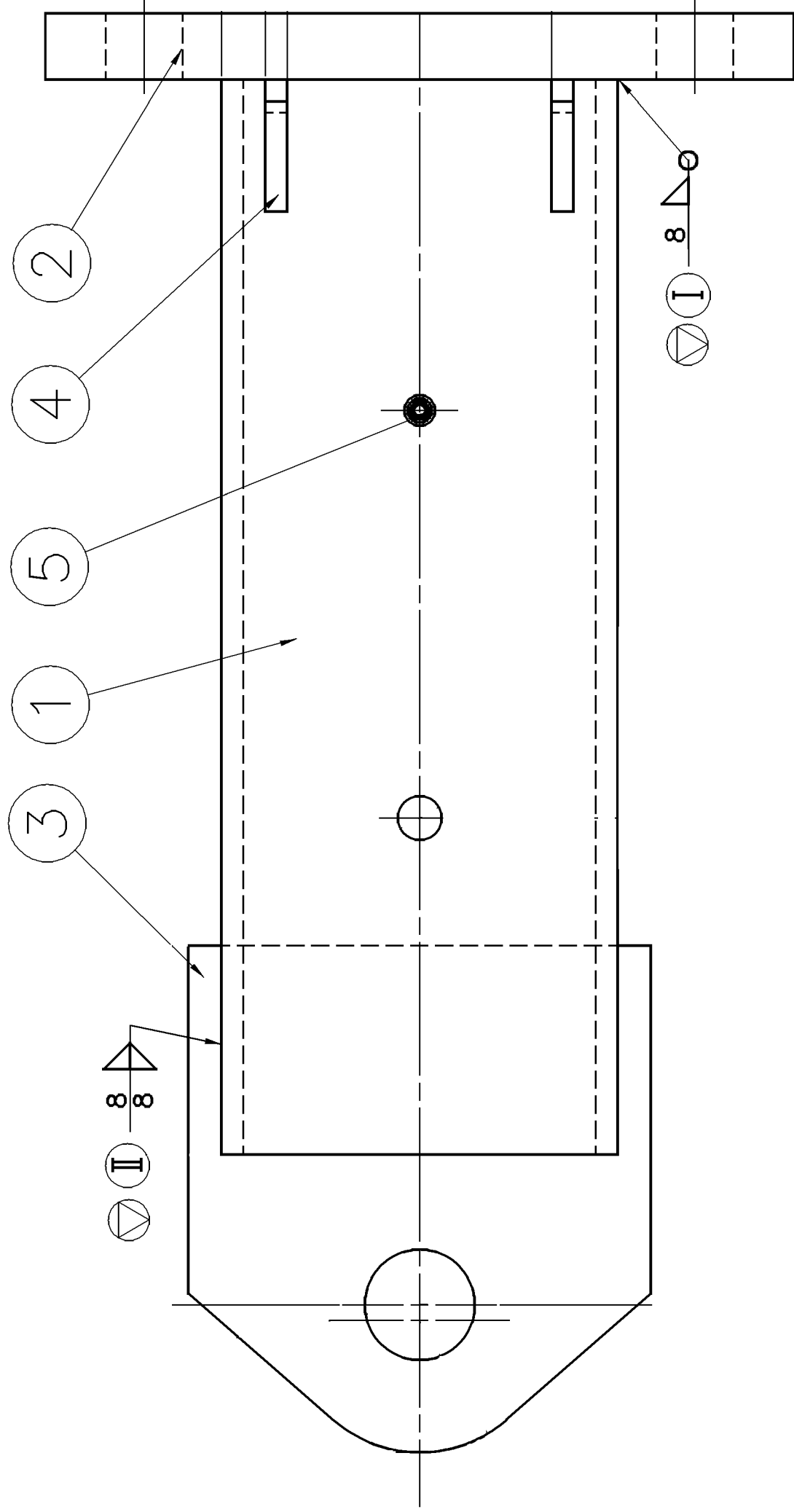
[illegible][illegible][illegible][illegible][illegible]





PIECE DE SÉCURITÉ SOUMISE À VÉRIFICATION SAFETY PARTS TO BE CHECKED	3	NB de caractéristiques  NB of characteristics marked 
--	---	--

[illegible]

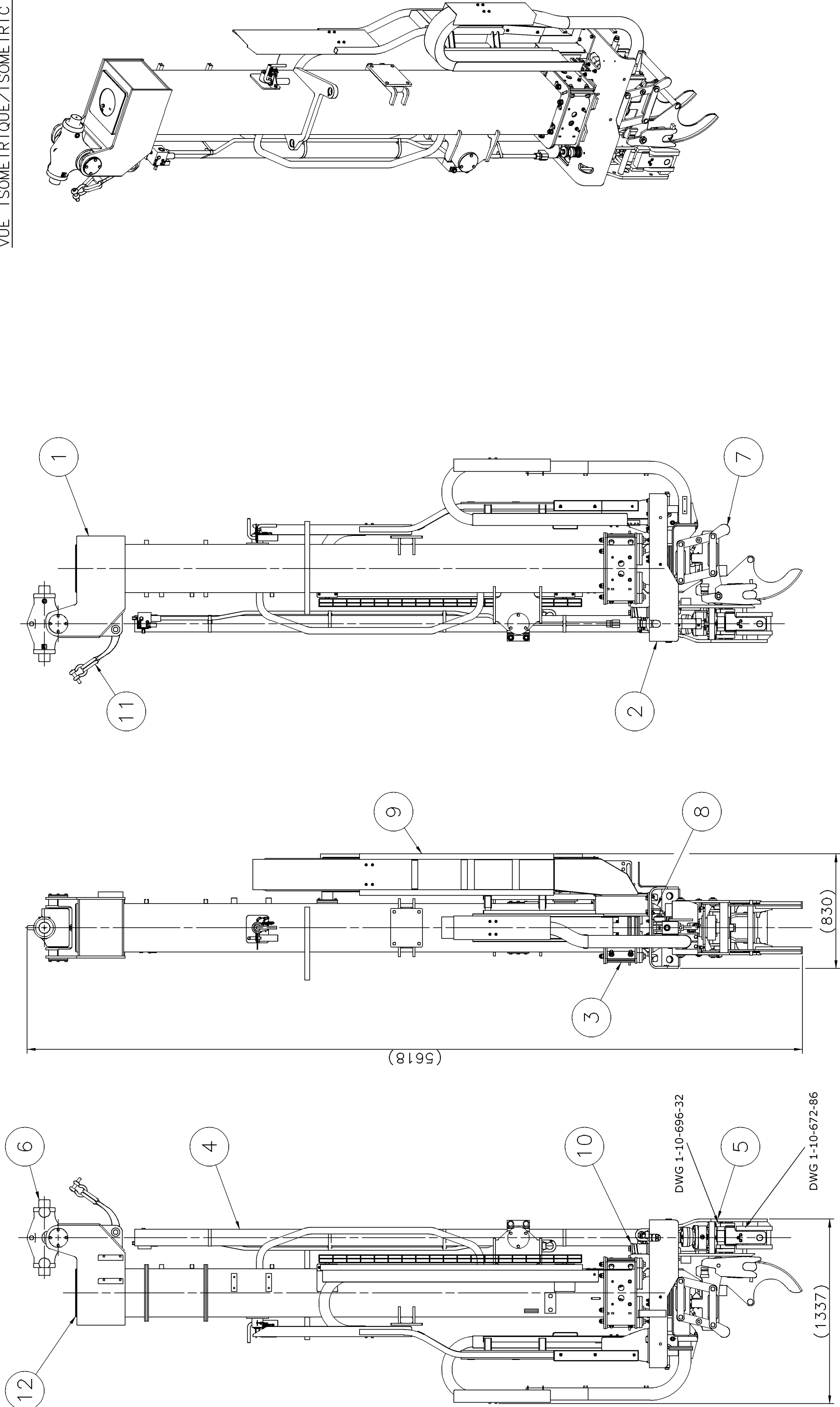
REV.	DATE	NAME	DESCRIPTION
01	14/04/21	SETURJET/PMH add welding	IDENTIFICATION
IF NOT SPECIFIED, USE GENERAL TOLERANCES IN ACCORDANCE WITH ISO 2768-mS; ISO 13269-SF; ISO 9002-CT12-2006 (M)			
MATERIAL N°			DESIGNATION
SCALE			NET WEIGHT
2:5			137,5 Kg
F. ES CLOCHE DE PREHENSION			REV.
A. HOOKING CLAMP			
		DIMENSION : PRO. DENIS DATE : 04/12/08 CHECKER : W. SCHLUTER DATE : 02/12/08	
		ORDER N° : 10664 DRAWING N° : 10664	SHEET : 1 / 1 00



PRECONISATION DE SOUDAGE WELDING REQUIREMENT							
PROCEDURE PROCESS:	136						
<table border="1"> <tr> <td>TRAITEMENT THERMIQUE HEAT TREATMENT :</td> <td>DOCUMENTS SPECIFICATION E.C.1th N° 00.982-08</td> </tr> <tr> <td>TYPE TYPE:</td> <td></td> </tr> <tr> <td> CONTRAINTES STRESS SPECIFICATION E.C.1th N° 00.982-08 QUALITE CLASS N° : C CLASSE DE QUALITE N° : VISUEL / VISUAL RESSEUGE / PENETRANT : 100 RADIOGRAPHIE : 100 RADIOGRAPHIC : ULTRASONS / ULTRASONIC : 0 0 0 </td> <td>% % % % %</td> </tr> </table>		TRAITEMENT THERMIQUE HEAT TREATMENT :	DOCUMENTS SPECIFICATION E.C.1 th N° 00.982-08	TYPE TYPE:		CONTRAINTES STRESS SPECIFICATION E.C.1 th N° 00.982-08 QUALITE CLASS N° : C CLASSE DE QUALITE N° : VISUEL / VISUAL RESSEUGE / PENETRANT : 100 RADIOGRAPHIE : 100 RADIOGRAPHIC : ULTRASONS / ULTRASONIC : 0 0 0	% % % % %
TRAITEMENT THERMIQUE HEAT TREATMENT :	DOCUMENTS SPECIFICATION E.C.1 th N° 00.982-08						
TYPE TYPE:							
CONTRAINTES STRESS SPECIFICATION E.C.1 th N° 00.982-08 QUALITE CLASS N° : C CLASSE DE QUALITE N° : VISUEL / VISUAL RESSEUGE / PENETRANT : 100 RADIOGRAPHIE : 100 RADIOGRAPHIC : ULTRASONS / ULTRASONIC : 0 0 0	% % % % %						
<table border="1"> <tr> <td>SOUDEUSE REP WELD REP:</td> <td>(I) and (II)</td> </tr> <tr> <td colspan="2">SOUDEURE ETANCHE / AIR TIGHTNESS WELDING: REPRETE T = soudure à vérifier MARK T = welding to be checked <div style="border: 1px solid black; width: 40px; height: 40px; margin: 10px auto; display: flex; align-items: center; justify-content: center;">0</div> NB de repères T N° of T mark </td> </tr> </table>		SOUDEUSE REP WELD REP:	(I) and (II)	SOUDEURE ETANCHE / AIR TIGHTNESS WELDING: REPRETE T = soudure à vérifier MARK T = welding to be checked <div style="border: 1px solid black; width: 40px; height: 40px; margin: 10px auto; display: flex; align-items: center; justify-content: center;">0</div> NB de repères T N° of T mark			
SOUDEUSE REP WELD REP:	(I) and (II)						
SOUDEURE ETANCHE / AIR TIGHTNESS WELDING: REPRETE T = soudure à vérifier MARK T = welding to be checked <div style="border: 1px solid black; width: 40px; height: 40px; margin: 10px auto; display: flex; align-items: center; justify-content: center;">0</div> NB de repères T N° of T mark							
VOIR DOCUMENTS E.C.1 th DE VERIFICATION N° 00.982-08 SEE E.C.1 th CHECKING DOCUMENTS N° 00.982-08							

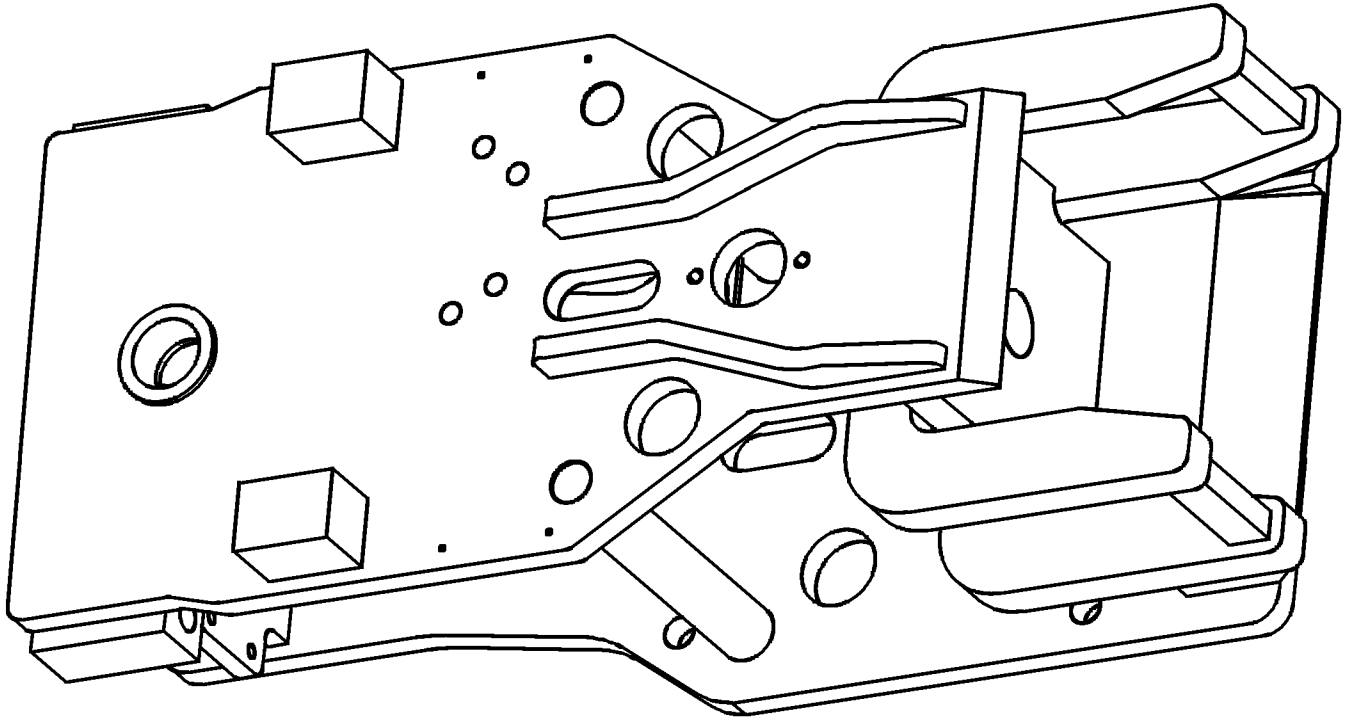
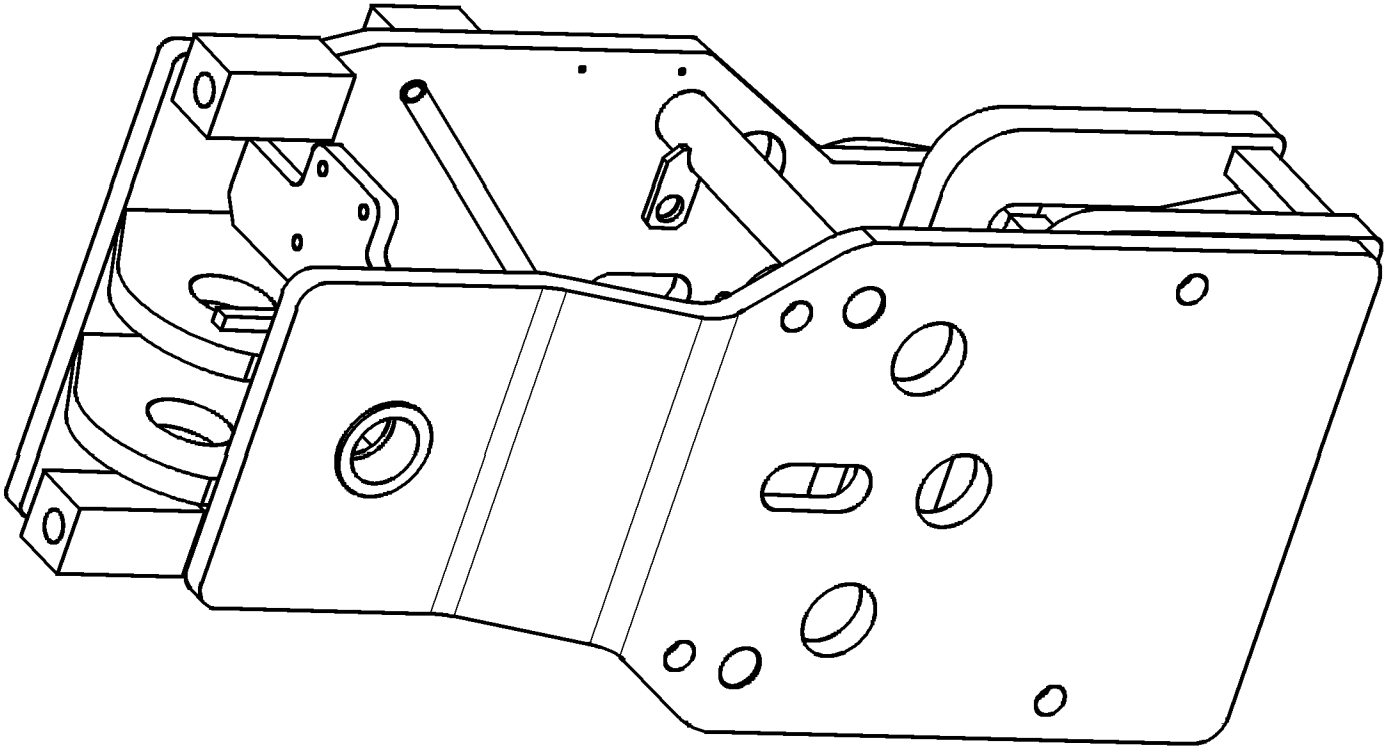
REV.	DATE	NAME	DESCRIPTION		DESIGNATION	NET WEIGHT
IF NOT SPECIFIED, USE GENERAL TOLERANCES IN ACCORDANCE WITH ISO 2768-MK ; ISO 1302-BF ; ISO 8062-CT12-RMA 6(H)						
MATERIAL N°						
SCALE		70 Kg				
2 : 5		F. ATTACHE 653x340x340				
		A. FASTENER 653x340x340				
		Société E.C.L. - 100 rue Chérolat 59790 RUMILLY - FRANCE Tél. : 03 20 28 70 99 Téléfax : (33) 03 20 28 70 99		DRAWER : PRO. DENIS DATE : 08/12/08		CHECKER : W. SZMIDT DATE : 10/12/08
A2	N° 1	10	664	88	N	SHEET 1 / 1
						00

VUE ISOMETRIQUE/ISOMETRIC VIEW



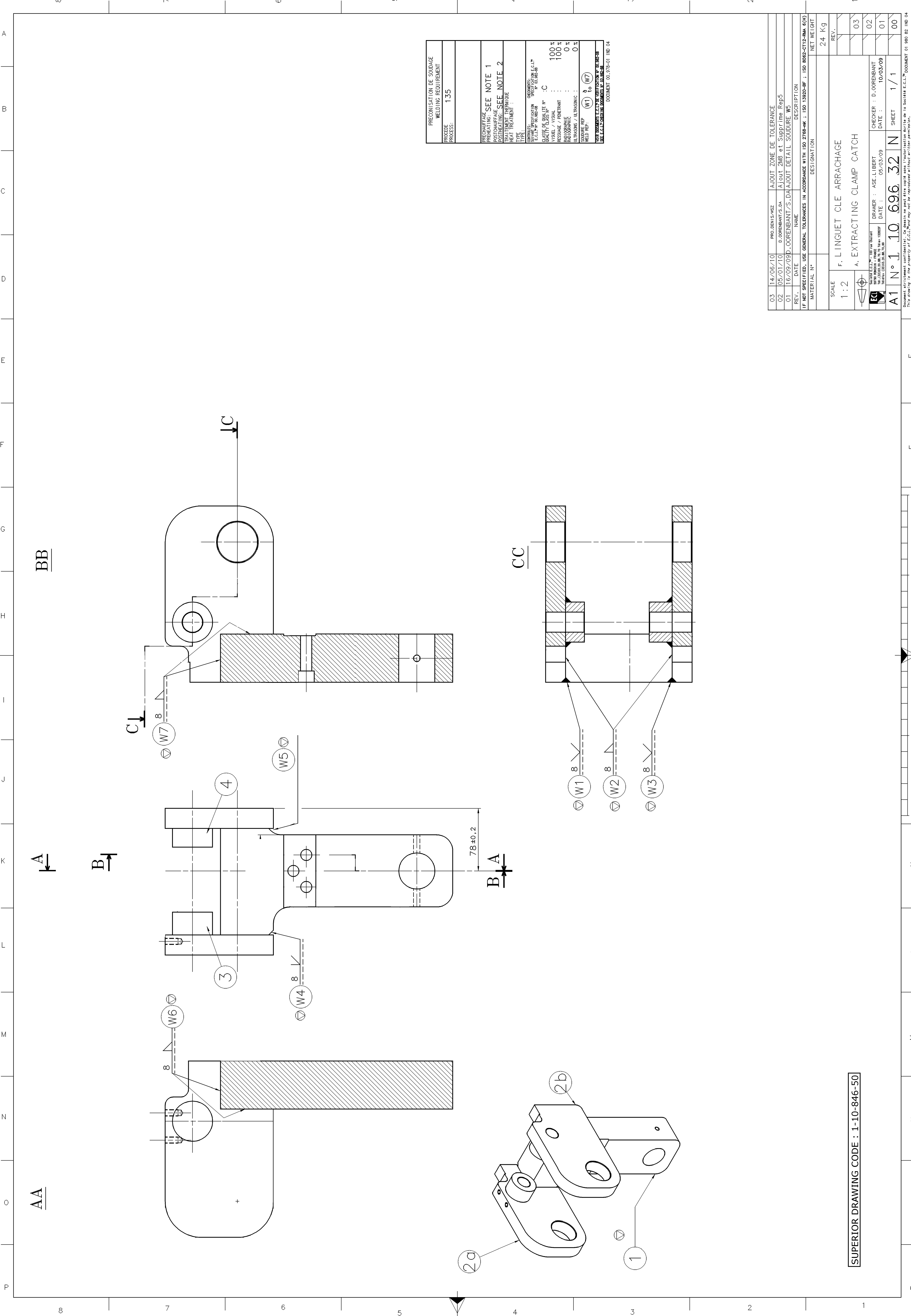
REV.	DATE	NAME	DESCRIPTION
IF NOT SPECIFIED, USE GENERAL TOLERANCES IN ACCORDANCE WITH ISO 2768-MK ; ISO 13920-BF ; ISO 8062-CT12-RWA 6(H)			
MATERIAL N°		DESIGNATION	
SCALE 1:20		NET WEIGHT 2406kg	
F. ENS PARTIE MECANIQUE ARRACHAGE SERRAGE		REV.	
A. EXTRACTING AND TIGHTENING MECHANICAL PART			
Société E.C.L.™ - 100 rue Chaient 59750 RONCHIN - FRANCE Tél. (33)03.20.88.70.70 Tél ex 13022F Téléfax (33)03.20.88.70.99		DRAWER : N.BAILLIE DATE : 01/12/10	
CHECKER : D.OORENBANT DATE : 01/12/10		SHEET 1 / 1	

TIRE DE/FROM 1.10.678.54



PIECE DE SECURITE SOUMISE A VERIFICATION SAFETY PARTS TO BE CHECKED	1	NB de caractéristiques Ⓢ NB of characteristics marked
--	---	--

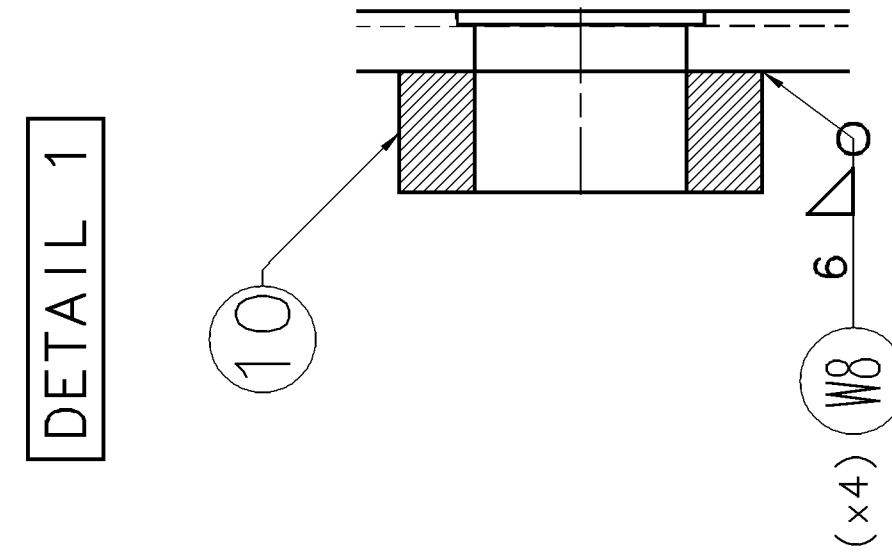
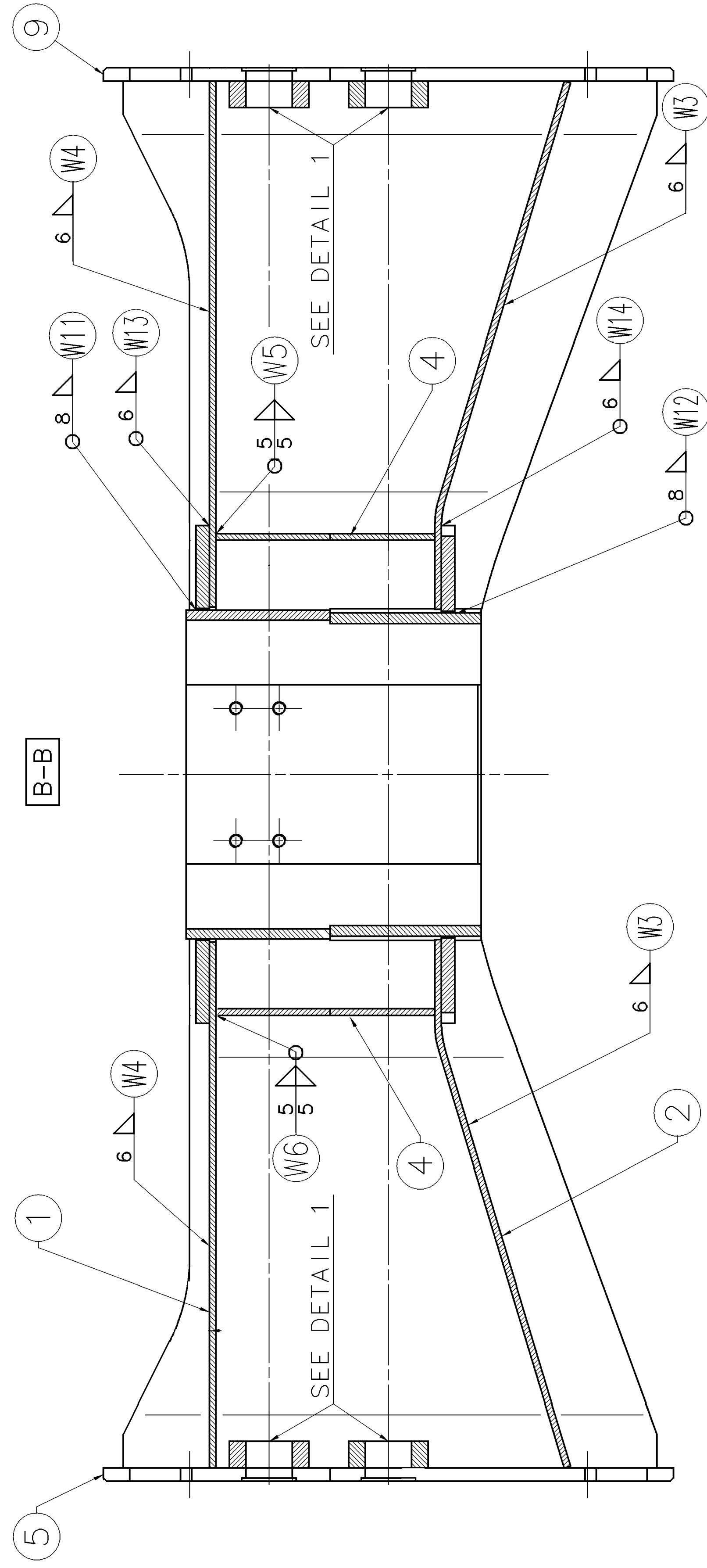
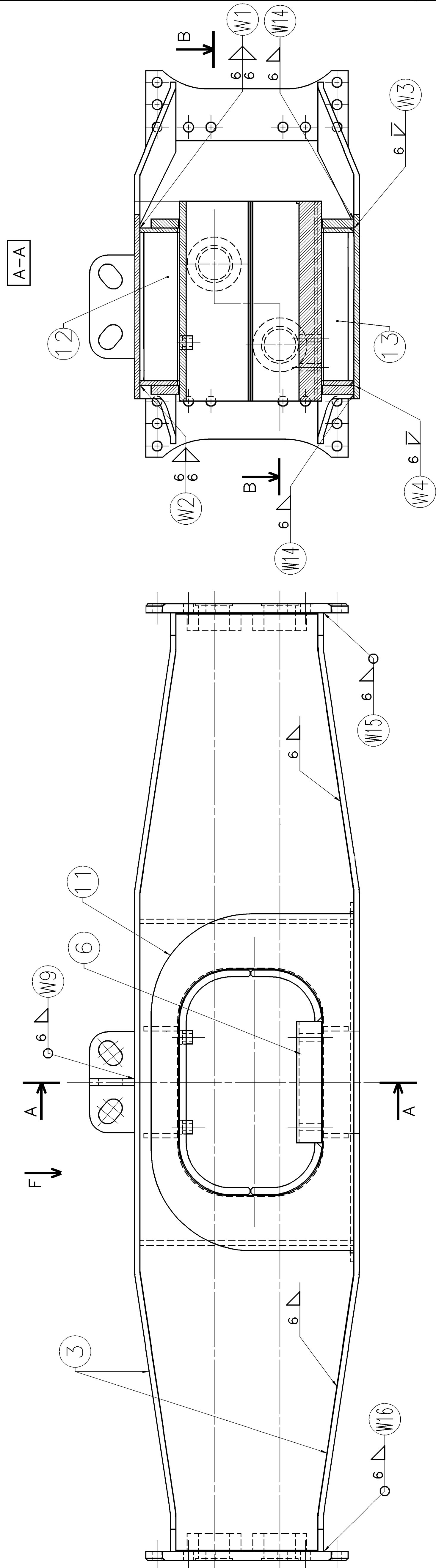
[illegible][illegible]



PRECONISATION DE SOUDAGE	
PROCEDURE	WELDING REQUIREMENT
PROCESS	135
PREHEATING	
PREHEATING : SEE NOTE 1	
POSTHEATING	
POSTHEATING : SEE NOTE 2	
HEAT TREATMENT	
HEAT TREATMENT : SEE NOTE 3	
TYPE	
TYPE : SEE NOTE 4	
WELDING	
WELDING : SEE NOTE 5	
WELDING : SEE NOTE 6	
WELDING : SEE NOTE 7	
WELDING : SEE NOTE 8	
WELDING : SEE NOTE 9	
WELDING : SEE NOTE 10	
WELDING : SEE NOTE 11	
WELDING : SEE NOTE 12	
WELDING : SEE NOTE 13	
WELDING : SEE NOTE 14	
WELDING : SEE NOTE 15	
WELDING : SEE NOTE 16	
WELDING : SEE NOTE 17	
WELDING : SEE NOTE 18	
WELDING : SEE NOTE 19	
WELDING : SEE NOTE 20	
WELDING : SEE NOTE 21	
WELDING : SEE NOTE 22	
WELDING : SEE NOTE 23	
WELDING : SEE NOTE 24	
WELDING : SEE NOTE 25	
WELDING : SEE NOTE 26	
WELDING : SEE NOTE 27	
WELDING : SEE NOTE 28	
WELDING : SEE NOTE 29	
WELDING : SEE NOTE 30	
WELDING : SEE NOTE 31	
WELDING : SEE NOTE 32	
WELDING : SEE NOTE 33	
WELDING : SEE NOTE 34	
WELDING : SEE NOTE 35	
WELDING : SEE NOTE 36	
WELDING : SEE NOTE 37	
WELDING : SEE NOTE 38	
WELDING : SEE NOTE 39	
WELDING : SEE NOTE 40	
WELDING : SEE NOTE 41	
WELDING : SEE NOTE 42	
WELDING : SEE NOTE 43	
WELDING : SEE NOTE 44	
WELDING : SEE NOTE 45	
WELDING : SEE NOTE 46	
WELDING : SEE NOTE 47	
WELDING : SEE NOTE 48	
WELDING : SEE NOTE 49	
WELDING : SEE NOTE 50	
WELDING : SEE NOTE 51	
WELDING : SEE NOTE 52	
WELDING : SEE NOTE 53	
WELDING : SEE NOTE 54	
WELDING : SEE NOTE 55	
WELDING : SEE NOTE 56	
WELDING : SEE NOTE 57	
WELDING : SEE NOTE 58	
WELDING : SEE NOTE 59	
WELDING : SEE NOTE 60	
WELDING : SEE NOTE 61	
WELDING : SEE NOTE 62	
WELDING : SEE NOTE 63	
WELDING : SEE NOTE 64	
WELDING : SEE NOTE 65	
WELDING : SEE NOTE 66	
WELDING : SEE NOTE 67	
WELDING : SEE NOTE 68	
WELDING : SEE NOTE 69	
WELDING : SEE NOTE 70	
WELDING : SEE NOTE 71	
WELDING : SEE NOTE 72	
WELDING : SEE NOTE 73	
WELDING : SEE NOTE 74	
WELDING : SEE NOTE 75	
WELDING : SEE NOTE 76	
WELDING : SEE NOTE 77	
WELDING : SEE NOTE 78	
WELDING : SEE NOTE 79	
WELDING : SEE NOTE 80	
WELDING : SEE NOTE 81	
WELDING : SEE NOTE 82	
WELDING : SEE NOTE 83	
WELDING : SEE NOTE 84	
WELDING : SEE NOTE 85	
WELDING : SEE NOTE 86	
WELDING : SEE NOTE 87	
WELDING : SEE NOTE 88	
WELDING : SEE NOTE 89	
WELDING : SEE NOTE 90	
WELDING : SEE NOTE 91	
WELDING : SEE NOTE 92	
WELDING : SEE NOTE 93	
WELDING : SEE NOTE 94	
WELDING : SEE NOTE 95	
WELDING : SEE NOTE 96	
WELDING : SEE NOTE 97	
WELDING : SEE NOTE 98	
WELDING : SEE NOTE 99	
WELDING : SEE NOTE 100	


03	14/06/10	PRO. DENNIS/WGZ	AJOUT ZONE DE TOLERANCE
02	05/01/10	D. OORENBANT/S.DA	Ajout 2M8 et Supprline Rep5
01	16/09/09	D. OORENBANT/S.DA	AJOUT DETAIL SOUDURE W5
REV.	DATE	NAME	DESCRIPTION
IF NOT SPECIFIED, USE GENERAL TOLERANCES IN ACCORDANCE WITH ISO 2768-MS ; ISO 13920-BF ; ISO 9052-CT12-RMA 6(4)			DESIGNATION
MATERIAL N°			NET WEIGHT
SCALE			24 Kg
1 : 2			REV.
F. LINGUET CLE ARRACHAGE			03
A. EXTRACTING CLAMP CATCH			02
DRAWER : ASE, L. LIBERT			01
DATE : 05/03/09			00
CHECKER : D. OORENBANT			
DATE : 10/03/09			
SHEET			1 / 1
A1 N° 1 10 696 32 N			



SUPERIOR DRAWING CODE : 1-10-846-50

[illegible][illegible][illegible]

DOCUMENT 00.978-38 IND 06

S355JR
FOR ALL MARKS
EXCEPT MARK :



3	NB de caractéristiques  NB of characteristics marked 
---	--

DOCUMENT 00.978-37 IND 08

SAUF INDICATION
-TOL DEBIT-FORMAGE-ASSEMBLAGE : $\pm 1\text{ mm}$
-CASSER LES ANGLES VIFS

EXCEPT INDICATION
-CUT-FOLDING-ASSEMBLING: $\pm 1\text{mm}$
-BREAK SHARP EDGES

[illegible]

SUPERIOR DRAWING CODE : 1-10-848-34

14

10

1

1

10

10

10

1101

1101

10

10

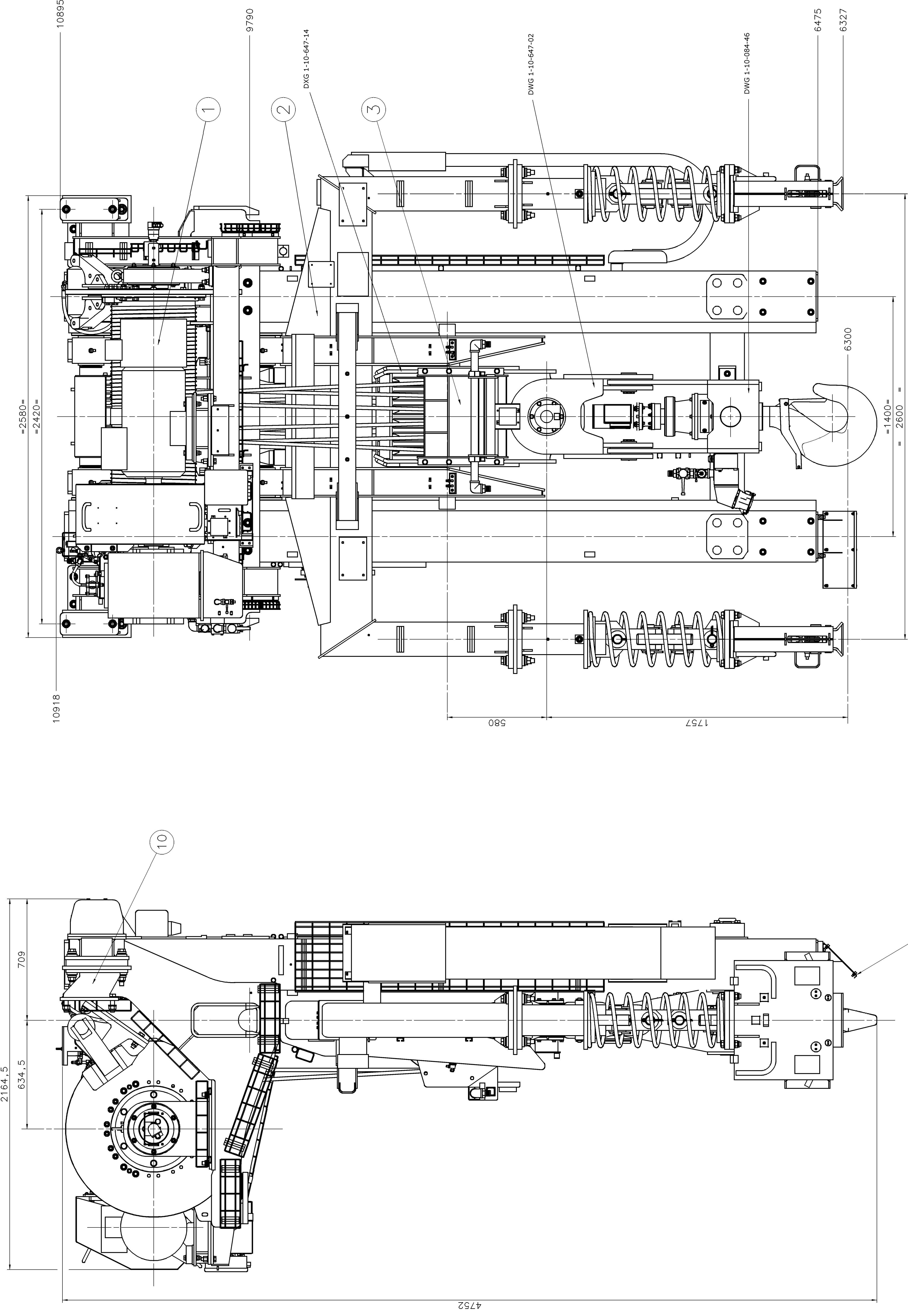
5

10

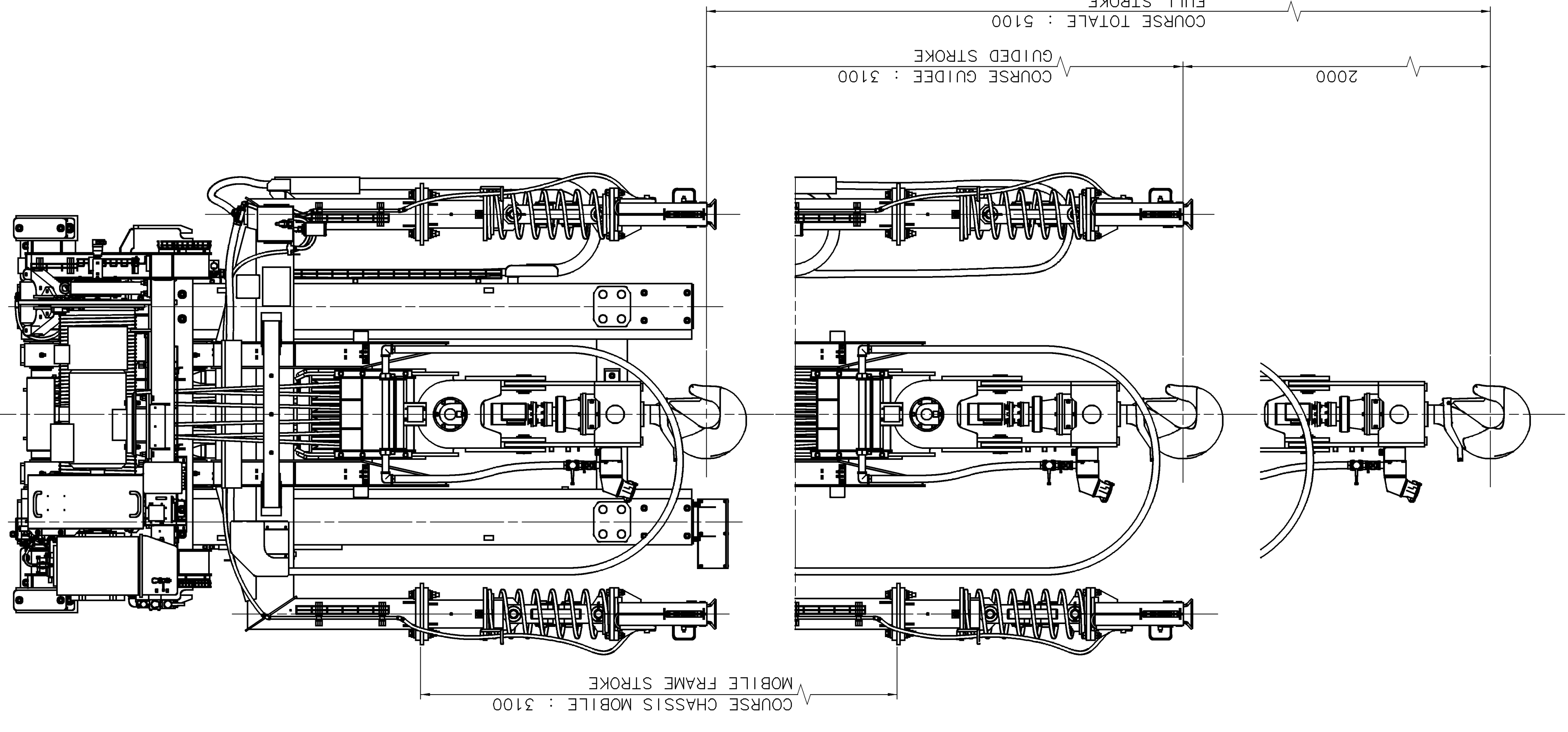
Document
Title of
the work

ne peut être
noté de ré
mises.

5001645



ECHELLE/SCALE : 1/20



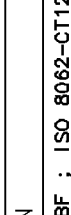
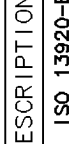

4 ELECTRICAL EQUIPMENT

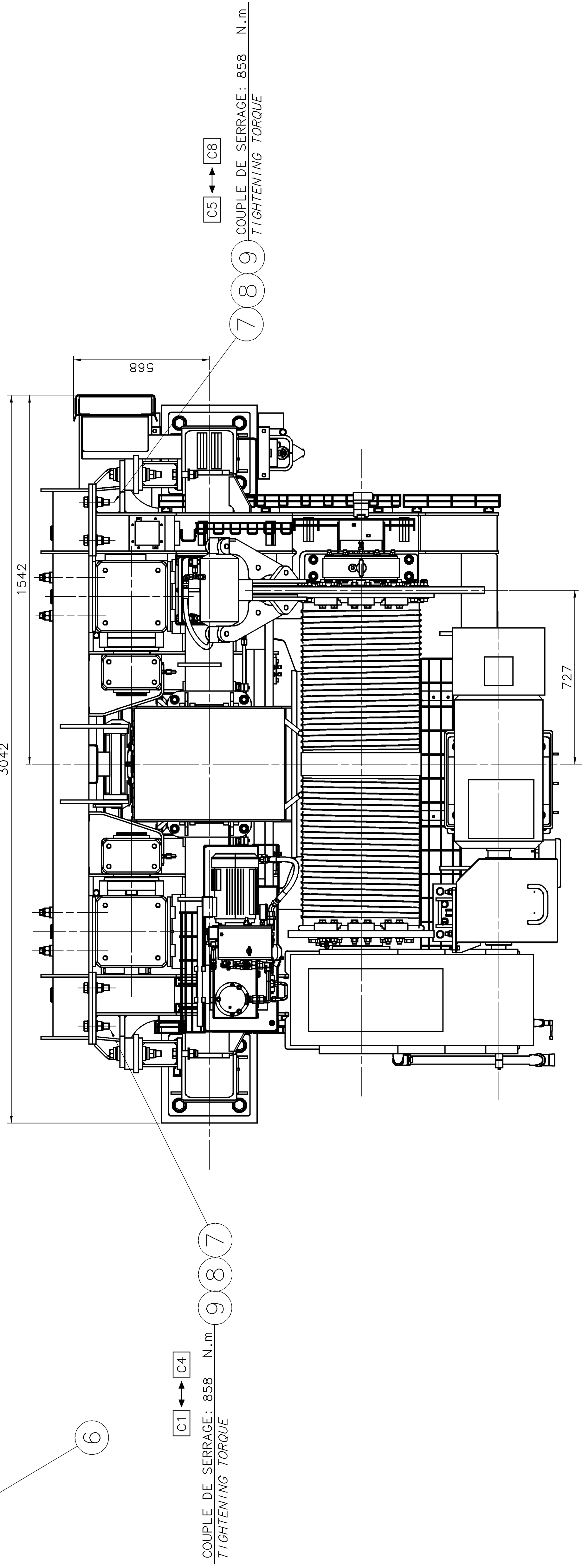
5 PNEUMATIC AND HYDRAULIC EQUIPMENT

NOTA :

VOIR LES PLANS CI-DESSOUS POUR LA MANIPULATION
LORS DU MONTAGE.
SEE DRAWING UNDER LINE FOR HANDLING DEVICE.

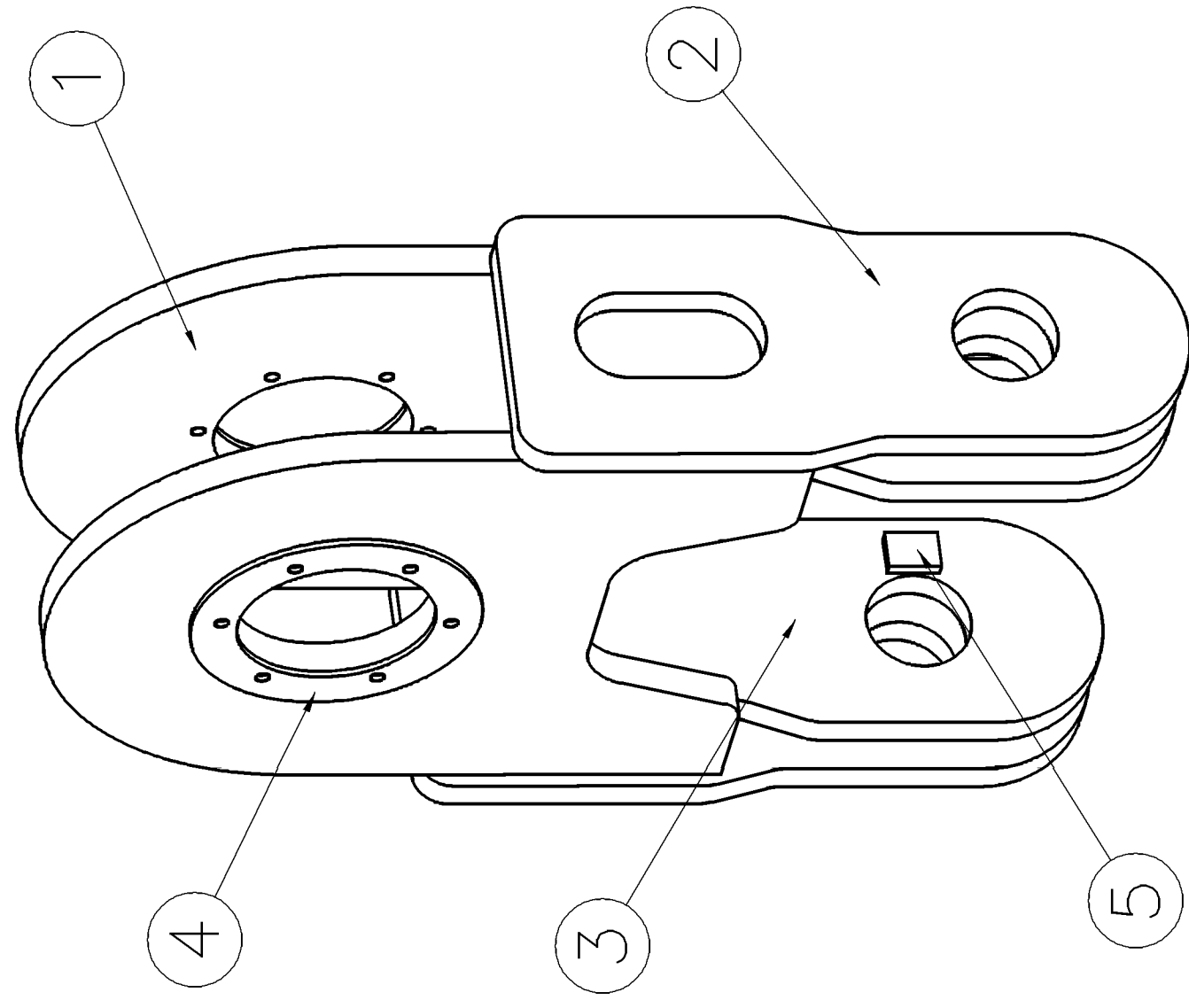
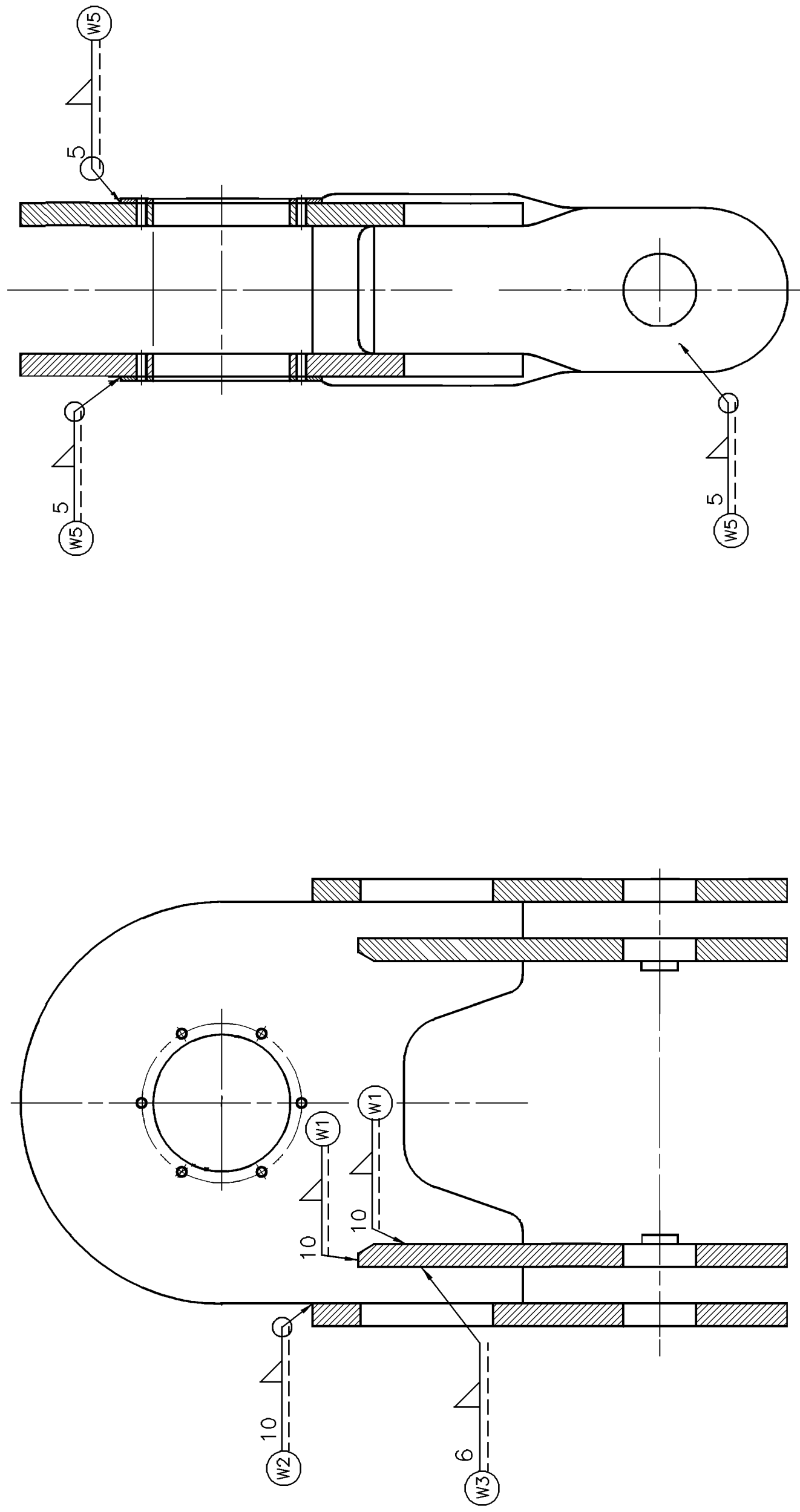
1-10-656-13 FIXED FRAME TOOL HANDLING DEVICE
1-10-667-53 SINGLE MAST GUIDING ASSY'S HANDLING



REV.	DATE	NAME	DESCRIPTION
IF NOT IDENTIFIED, USE GENERAL TOLERANCES IN ACCORDANCE WITH ISO 2768-mS; ISO 1302-mp; ISO 8062-CIT-60m (3H) UNLESS NOTED OTHERWISE			
DESIGNATION			WEIGHT 9500 Kg
SCALE	F. ENSEMBLE COULEE 36T		
1:10	A. 36 m TAPPING TOOL ASSY		
			
		EXAMPER: PHILIPPORE DATE: 18/10/2018 INCH DATE: 18/10/20	
			



DIMENSIONS A. CONTROLER	
DIMENSIONS A. TO BE CHECKED	
COTE F	= cote à vérifier
MEASURE F	= measure to be checked
COUPLE C	= couple à vérifier
TORQUE C	= torque to be checked
CARACTE-G	= caractéristique géométrique à vérifier
FEATURE G	= geometrical feature to be checked
<input type="checkbox"/>	NB of cotes F à contrôler
<input type="checkbox"/>	NB of F measures to be checked
<input checked="" type="checkbox"/>	NB of cotes de serrage C à contrôler
<input type="checkbox"/>	NB of C tightening torques to be checked
<input type="checkbox"/>	NB of caracté. géométriques G à contrôler
<input type="checkbox"/>	NB of G features to be checked

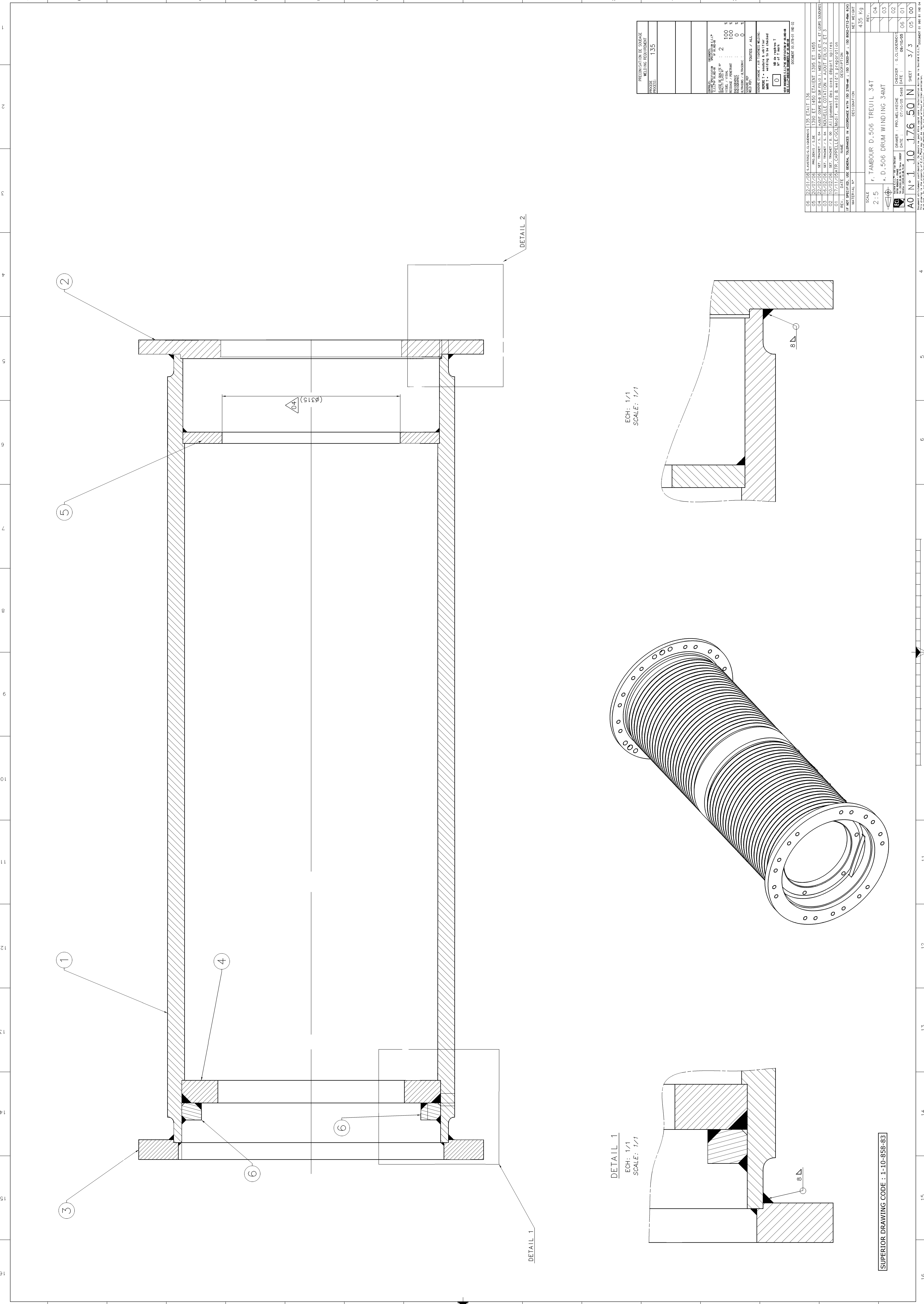
DOCUMENT 00.978-09 IND 07

[illegible]

REV.	DATE	SET. DEPARTMENT/PMO	ADD. WELDING IDENTIFICATION	DESCRIPTION
01	06/04/11			
IF NOT SPECIFIED, USE GENERAL TOLERANCES IN ACCORDANCE WITH ISO 2768-MS, ISO 13290-0F, ISO 8062-CT12-2M, 6 (H)				
MATERIAL N°		DESIGNATION		
SCALE				
1:5		F. CHAPE		
		A. CLEVIS		
		DRAWER : PRO. DENIS DATE : 30/01/09 CHECKER : W. SZYMIDT DATE : 12/02/09		
		100% C.E. - W. 100 use Sheet 50% BACHE - 50% BACHE 100% C.E. - W. 100 use Sheet 50% BACHE - 50% BACHE 100% C.E. - W. 100 use Sheet 50% BACHE - 50% BACHE		
A1	N° 1	10	64Z.02	N
				SHEET 1 / 1
				00
				01
				REV.
				130 Kg
				NET WEIGHT

SUPERIOR DRAWING CODE : 1-10-858-83

Document strictement confidentiel. Ce dessin ne peut être copié sans l'autorisation écrite de la Société E.C.L.TM.
This drawing is the property of E.C.L. and may not be reproduced without written permission.
 PLAN CAO - Ne pas modifier manuellement / CAD DRAWING - Do not change manually

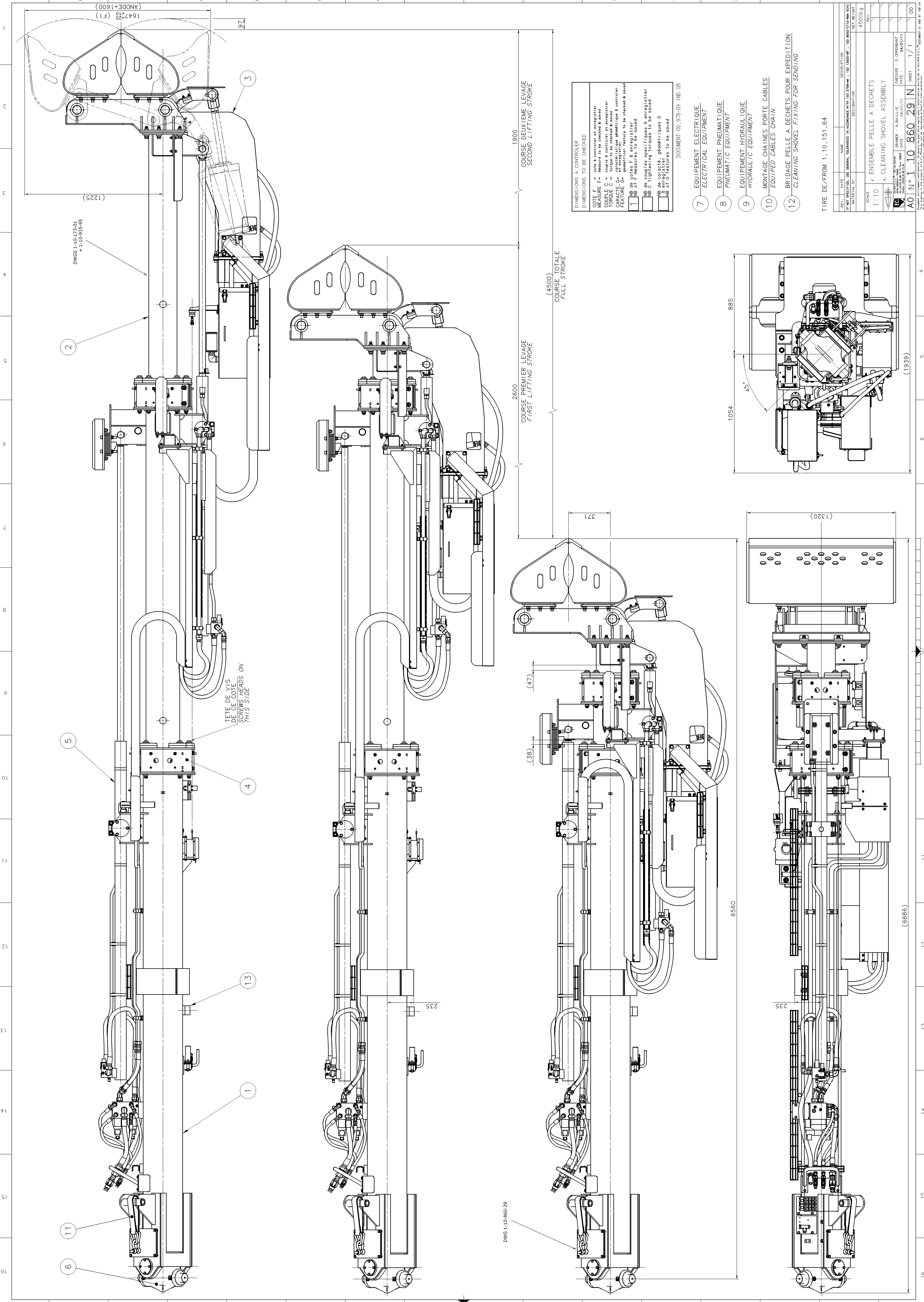


DETAIL 1
ECH: 1/1
SCALE: 1/1

ECH: 1/1
SCALE: 1/1

PRECONISATION DE Soudage	
PROCES	135
REVISIONS	
NO	DATE
01	12/11/08
02	12/11/08
03	12/11/08
04	12/11/08
05	12/11/08
06	12/11/08
07	12/11/08
08	12/11/08
09	12/11/08
10	12/11/08
11	12/11/08
12	12/11/08
13	12/11/08
14	12/11/08
15	12/11/08
16	12/11/08
17	12/11/08
18	12/11/08
19	12/11/08
20	12/11/08
21	12/11/08
22	12/11/08
23	12/11/08
24	12/11/08
25	12/11/08
26	12/11/08
27	12/11/08
28	12/11/08
29	12/11/08
30	12/11/08
31	12/11/08
32	12/11/08
33	12/11/08
34	12/11/08
35	12/11/08
36	12/11/08
37	12/11/08
38	12/11/08
39	12/11/08
40	12/11/08
41	12/11/08
42	12/11/08
43	12/11/08
44	12/11/08
45	12/11/08
46	12/11/08
47	12/11/08
48	12/11/08
49	12/11/08
50	12/11/08
51	12/11/08
52	12/11/08
53	12/11/08
54	12/11/08
55	12/11/08
56	12/11/08
57	12/11/08
58	12/11/08
59	12/11/08
60	12/11/08
61	12/11/08
62	12/11/08
63	12/11/08
64	12/11/08
65	12/11/08
66	12/11/08
67	12/11/08
68	12/11/08
69	12/11/08
70	12/11/08
71	12/11/08
72	12/11/08
73	12/11/08
74	12/11/08
75	12/11/08
76	12/11/08
77	12/11/08
78	12/11/08
79	12/11/08
80	12/11/08
81	12/11/08
82	12/11/08
83	12/11/08
84	12/11/08
85	12/11/08
86	12/11/08
87	12/11/08
88	12/11/08
89	12/11/08
90	12/11/08
91	12/11/08
92	12/11/08
93	12/11/08
94	12/11/08
95	12/11/08
96	12/11/08
97	12/11/08
98	12/11/08
99	12/11/08
100	12/11/08

06	12/11/08	1	PREMIERE EDITION	135	ETAT 135
05	12/07/06	1	PROJETS / S. 04	1350	ET 1450
04	12/02/06	1	PROJETS / S. 04	1350	ET 1450
03	16/02/06	1	PROJETS / S. 04	1350	ET 1450
02	16/02/06	1	PROJETS / S. 04	1350	ET 1450
01	17/11/08	1	PROJETS / S. 04	1350	ET 1450
REV.	DATE	NAME	DESCRIPTION	DESIGNATION	NET WEIGHT
IF NOT SPECIFIED, USE GENERAL TOLERANCES IN ACCORDANCE WITH ISO 2768-MF : ISO 13900-MF : ISO 13900-MF : ISO 13900-MF : ISO 13900-MF : ISO 13900-MF					
MATERIAL N°					
SCALE					
2 : 5					
F. TAMBOUR D. 506 TREUIL 34T					
A. D. 506 DRUM WINDING 34MT					
DRAWN BY : PROJETS / S. 04					
CHECKED BY : PROJETS / S. 04					
DATE : 12/11/08					
SHEET : 3 / 3					
SUPERIOR DRAWING CODE : 1-10-858-83					



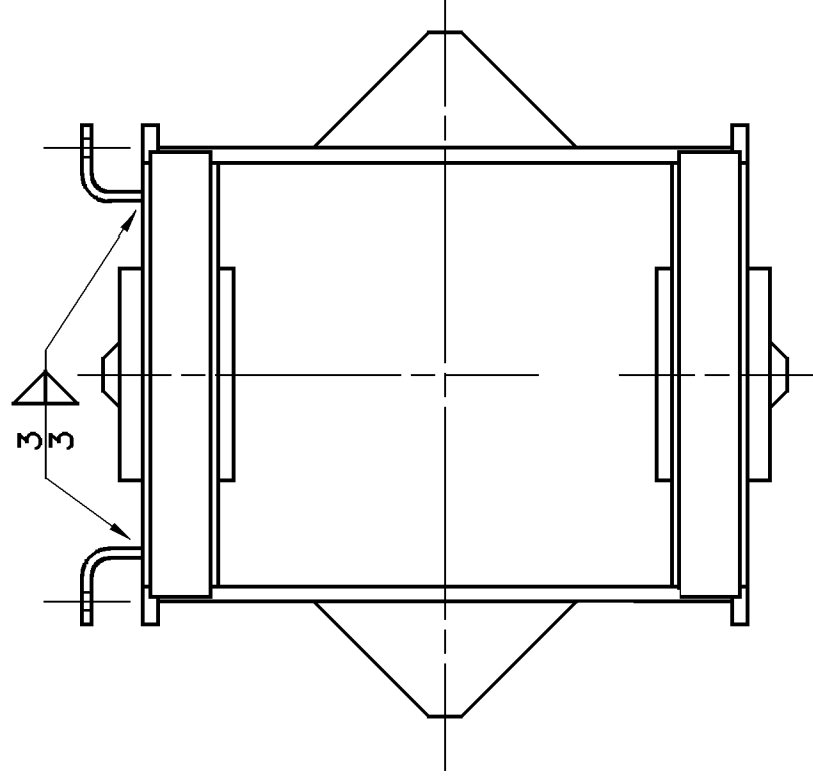
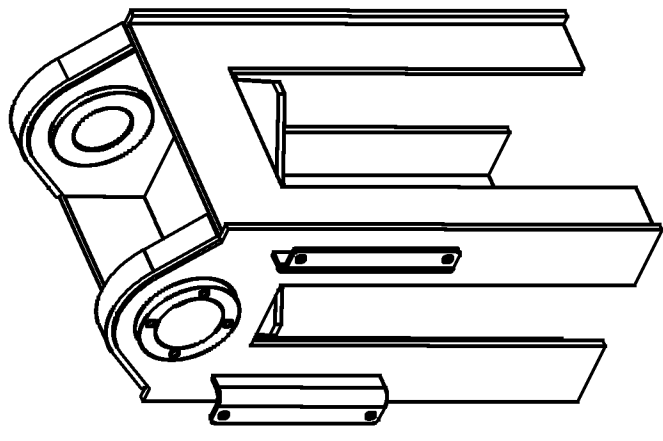
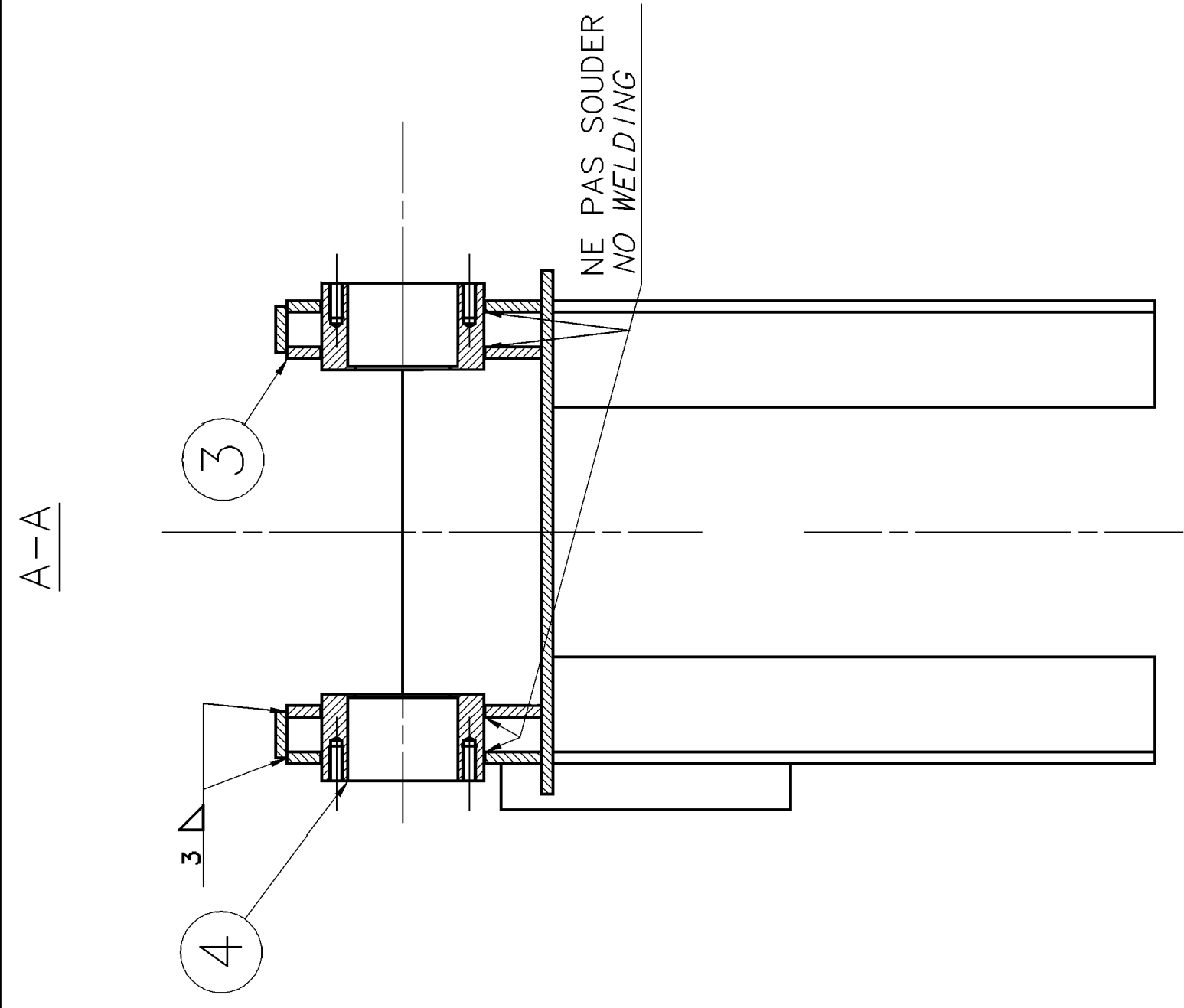
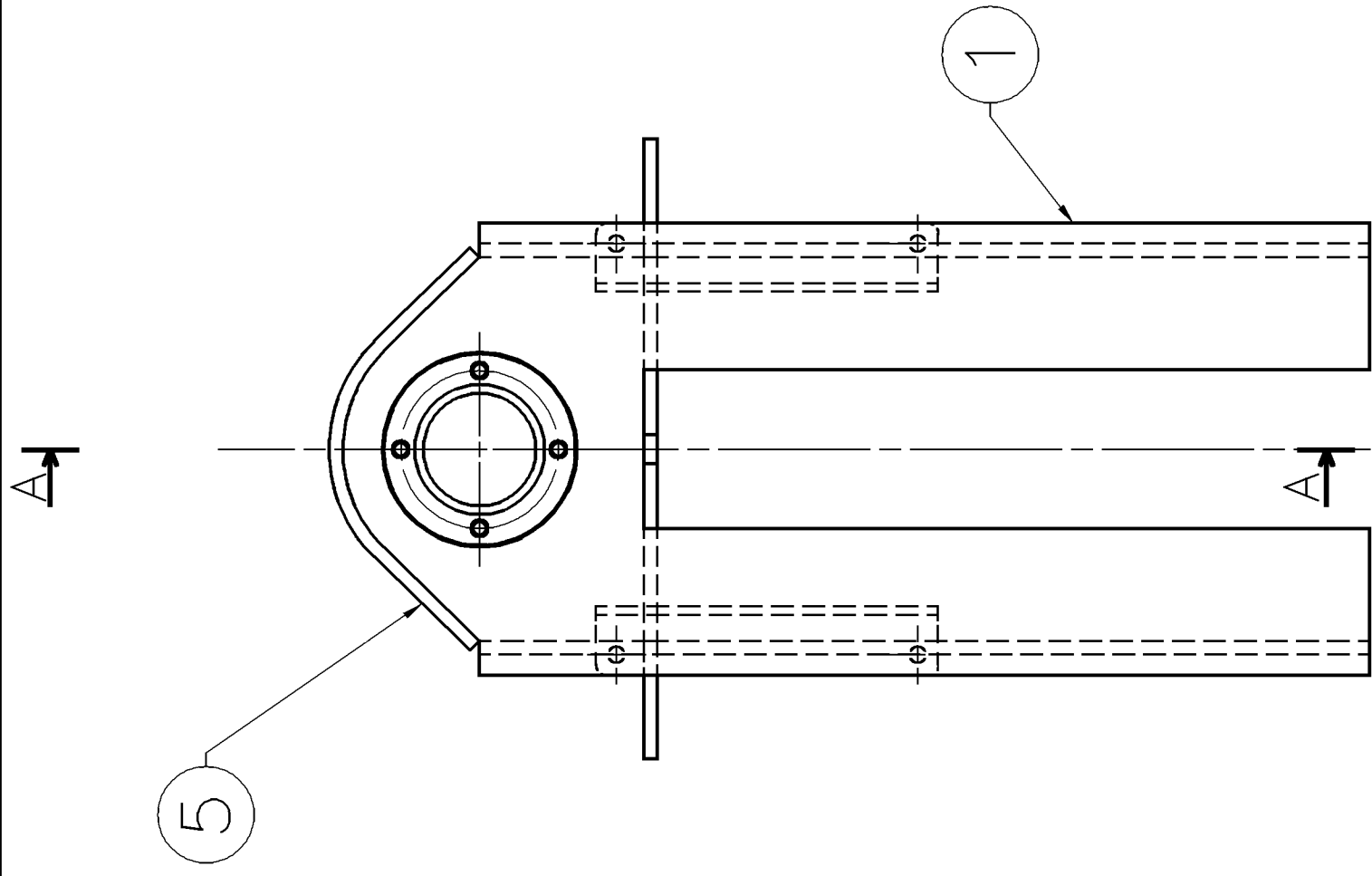
DIMENSIONS A CONTROLER	
DIMENSIONS TO BE CHECKED	
NOTE	" cote à contrôler et enregistrer
LIFE	" durée de service à contrôler et enregistrer
CABLE	" couple à contrôler et enregistrer
TORQUE	" couple à contrôler et enregistrer
CARACTE	" caractéristique géométrique à contrôler
FEATURE	" géométrical feature to be checked & saved
1	NB de cotes F à enregistrer
2	NB of F measures to be saved
3	de couples spécifiques à enregistrer
4	NB C lightning torques to be saved
5	de caracte. géométriques G
6	NB of G features to be saved



DOCUMENT 00.978-09 IND 08

- 7 EQUIPEMENT ELECTRIQUE / ELECTRICAL EQUIPMENT
- 8 EQUIPEMENT PNEUMATIQUE / PNEUMATIC EQUIPMENT
- 9 EQUIPEMENT HYDRAULIQUE / HYDRAULIC EQUIPMENT
- 10 MONTAGE CHAINES PORTE CABLES / EQUIPPED CABLES CHAIN
- 12 BRIDAGE PELLE A DECHETS POUR EXPEDITION / CLEANING SHOVEL FIXING FOR SENDING

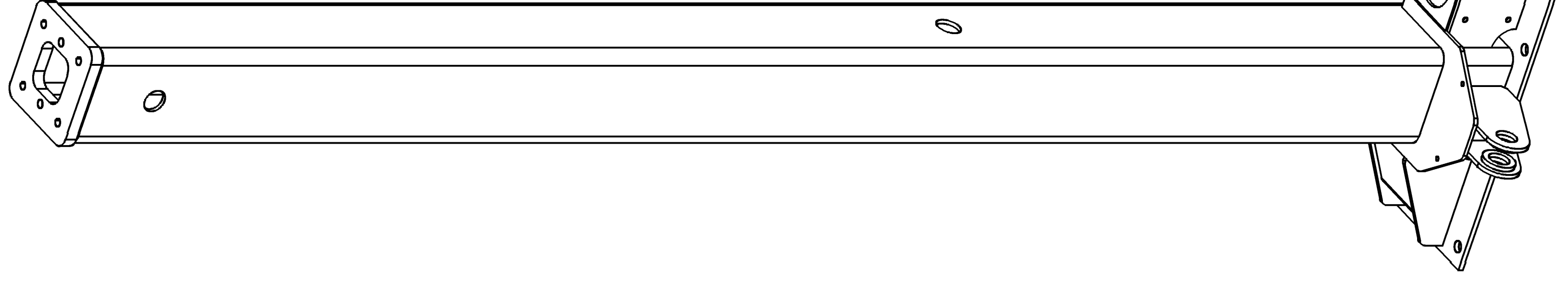
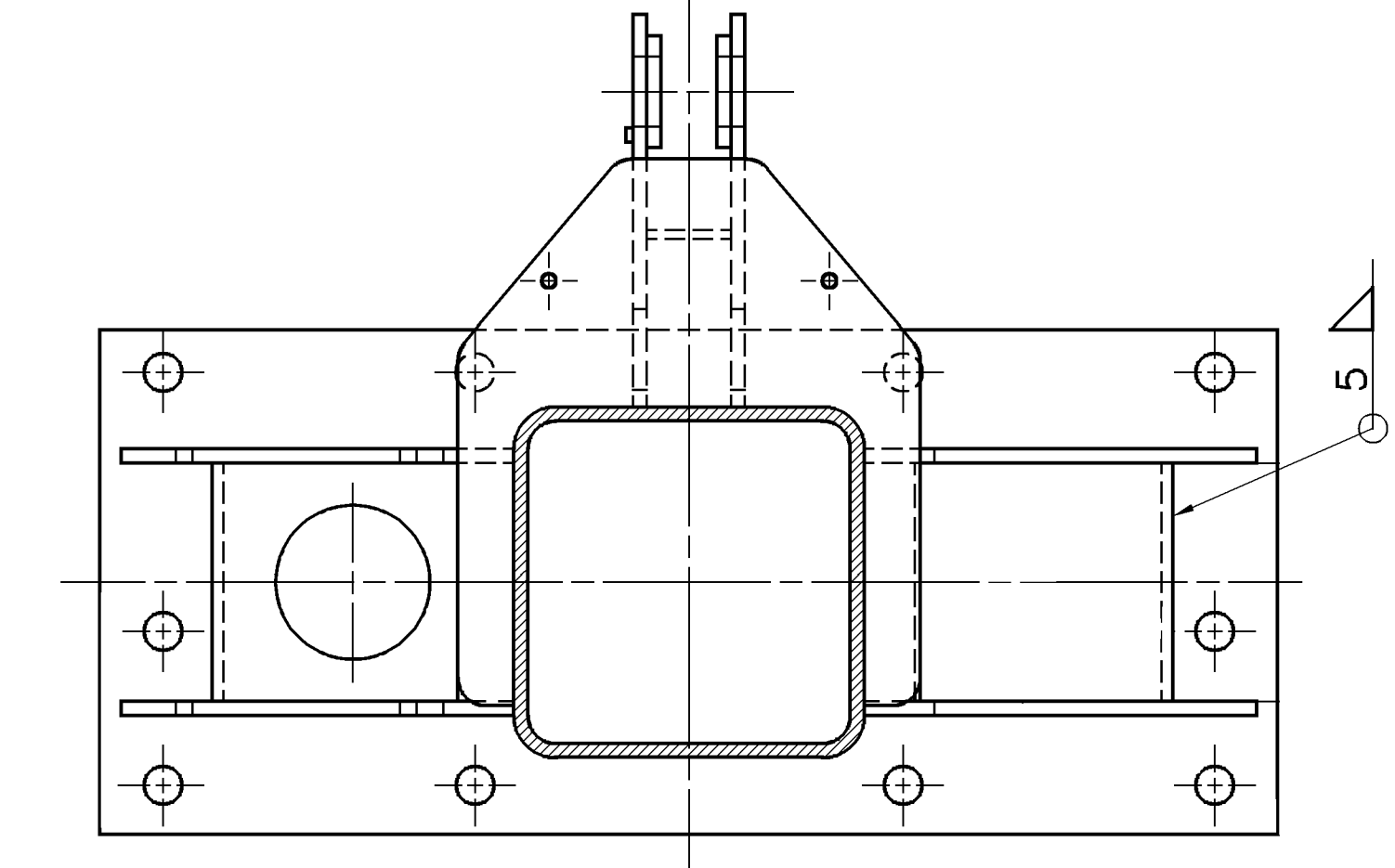
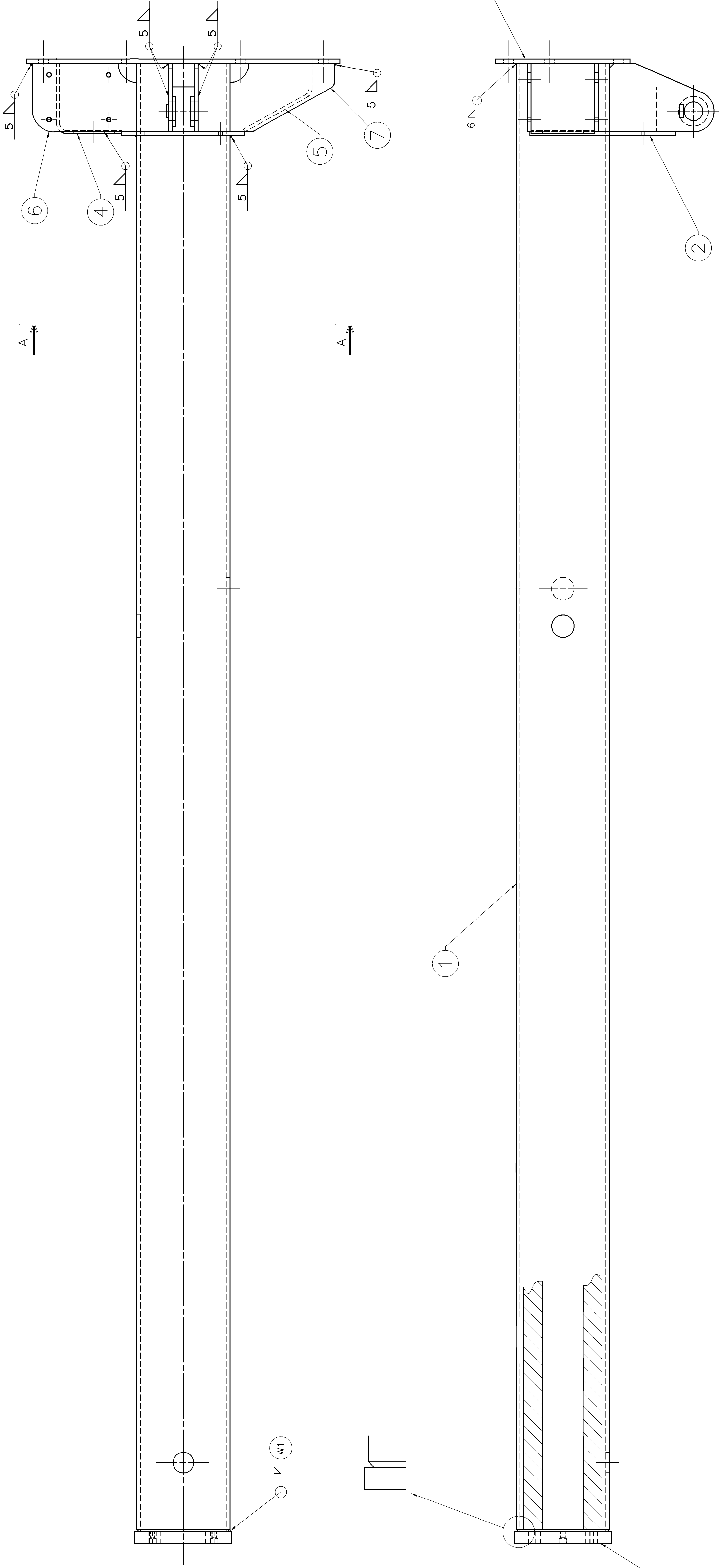
TIRE DE/FROM 1.10.151.64

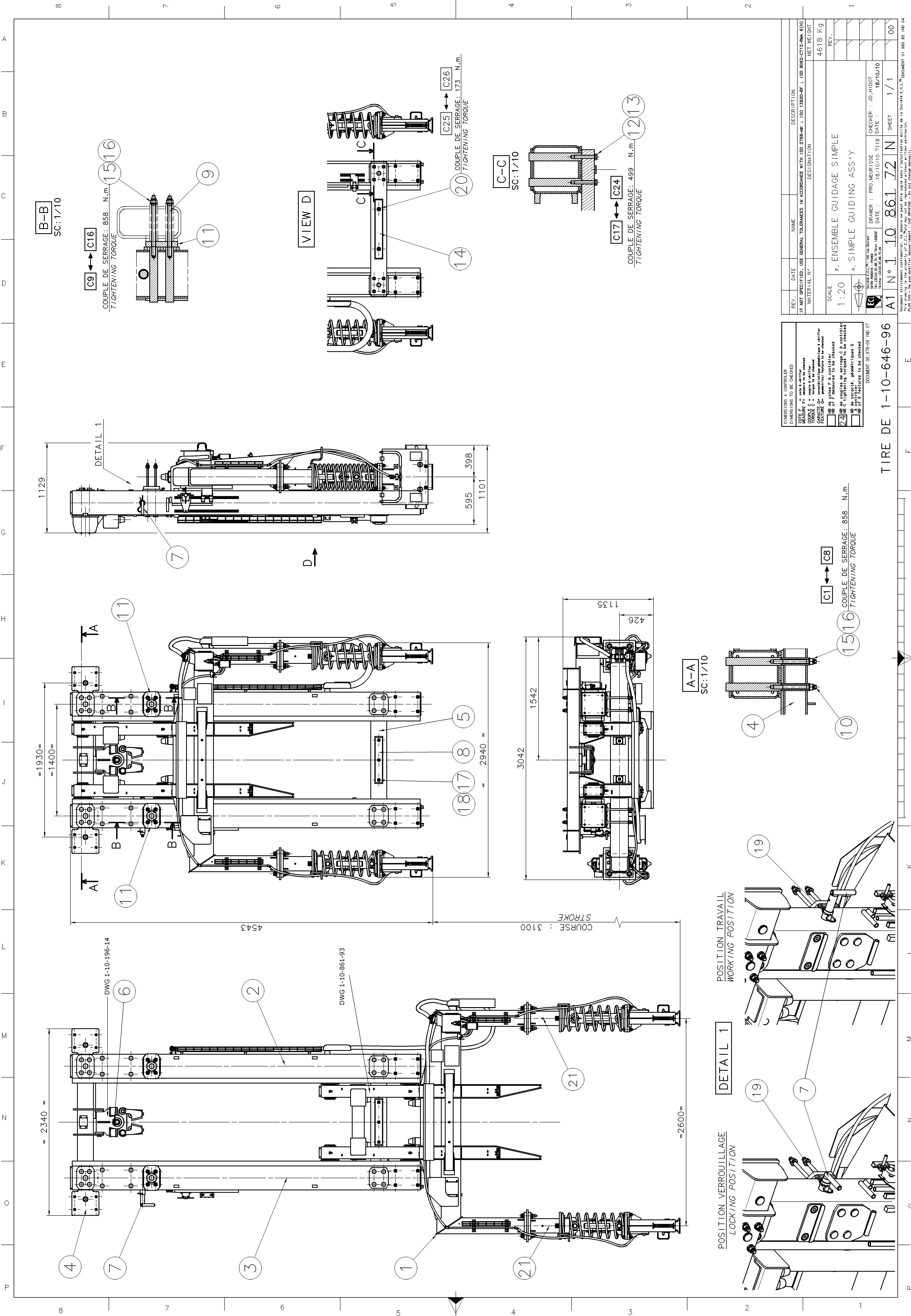
REV.	DATE	NAME	DESCRIPTION
IF NOT SPECIFIED, USE GENERAL TOLERANCES IN ACCORDANCE WITH ISO 2768-MK : ISO 13282-MF : ISO 8042-CTD-2004-010			
MATERIAL 1"			DESIGNATION
SCALE			NET WEIGHT
1:10			4500kg
F. ENSEMBLE PELLE A DECHETS			REV.
A. CLEANING SHOVEL ASSEMBLY			REV.
DRAWN BY: N. BAULLE			DESIGNER: D. COUSIN
CHECKED BY: N. BAULLE			DATE: 04/09/11
A0 N° 1 JO 860 29 N			SHEET 1 / 1
00			00

[illegible]

REV.	DATE	NAME	DESCRIPTION					
IF NOT SPECIFIED, USE GENERAL TOLERANCES IN ACCORDANCE WITH ISO 2768-mK ; ISO 13920-BF ; ISO 8062-CT12-RMA 6(H)								
MATERIAL N°	DESIGNATION		NET WEIGHT					
			76Kg					
SCALE	F. CAISSON ACCROCHAGE PELLE A. SHOVEL UPPER FORK							
1 : 5								
								
	Société E.C.L.M. - 100 rue d'Alant 54700 Merlain - BP 370 94** 1322ZF Tél : 03 83 33 20 88 70 99 Tél : 03 83 33 20 88 70 99		DRAWER : PRO. LUCHART DATE : 31/07/09					
A2	N° 1	10	742	65	N	SHEET	1 / 1	00

SUPERIOR DRAWING CODE : 1-10-860-29

[illegible][illegible][illegible]



B-B

SC:1/10

C9 ↔ C16

COUPLE DE SERRAGE: 858 N.m
TIGHTENING TORQUE

1516

DETAIL 1

VIEW D

C25 ↔ C26

COUPLE DE SERRAGE: 173 N.m
TIGHTENING TORQUE

C-C

SC:1/10

C17 ↔ C24

COUPLE DE SERRAGE: 499 N.m
TIGHTENING TORQUE

1213

DIMENSIONS A CONTROL	
DIMENSIONS TO BE CHECKED	
COTE F	à contrôler
USURE F	à vérifier
TORQUE C	à vérifier
GEOMETRIE C	à vérifier
GEOMETRIE D	à vérifier
GEOMETRIE E	à vérifier
GEOMETRIE F	à vérifier
GEOMETRIE G	à vérifier
GEOMETRIE H	à vérifier
GEOMETRIE I	à vérifier
GEOMETRIE J	à vérifier
GEOMETRIE K	à vérifier
GEOMETRIE L	à vérifier
GEOMETRIE M	à vérifier
GEOMETRIE N	à vérifier
GEOMETRIE O	à vérifier
GEOMETRIE P	à vérifier
GEOMETRIE Q	à vérifier
GEOMETRIE R	à vérifier
GEOMETRIE S	à vérifier
GEOMETRIE T	à vérifier
GEOMETRIE U	à vérifier
GEOMETRIE V	à vérifier
GEOMETRIE W	à vérifier
GEOMETRIE X	à vérifier
GEOMETRIE Y	à vérifier
GEOMETRIE Z	à vérifier

DOCUMENT 00.975-08 IND 07

TIRE DE 1-10-646-96

DOCUMENT 01.980-02 IND 04

POSITION TRAVAIL
WORKING POSITION

POSITION VERROUILLAGE
LOCKING POSITION

F

E

K

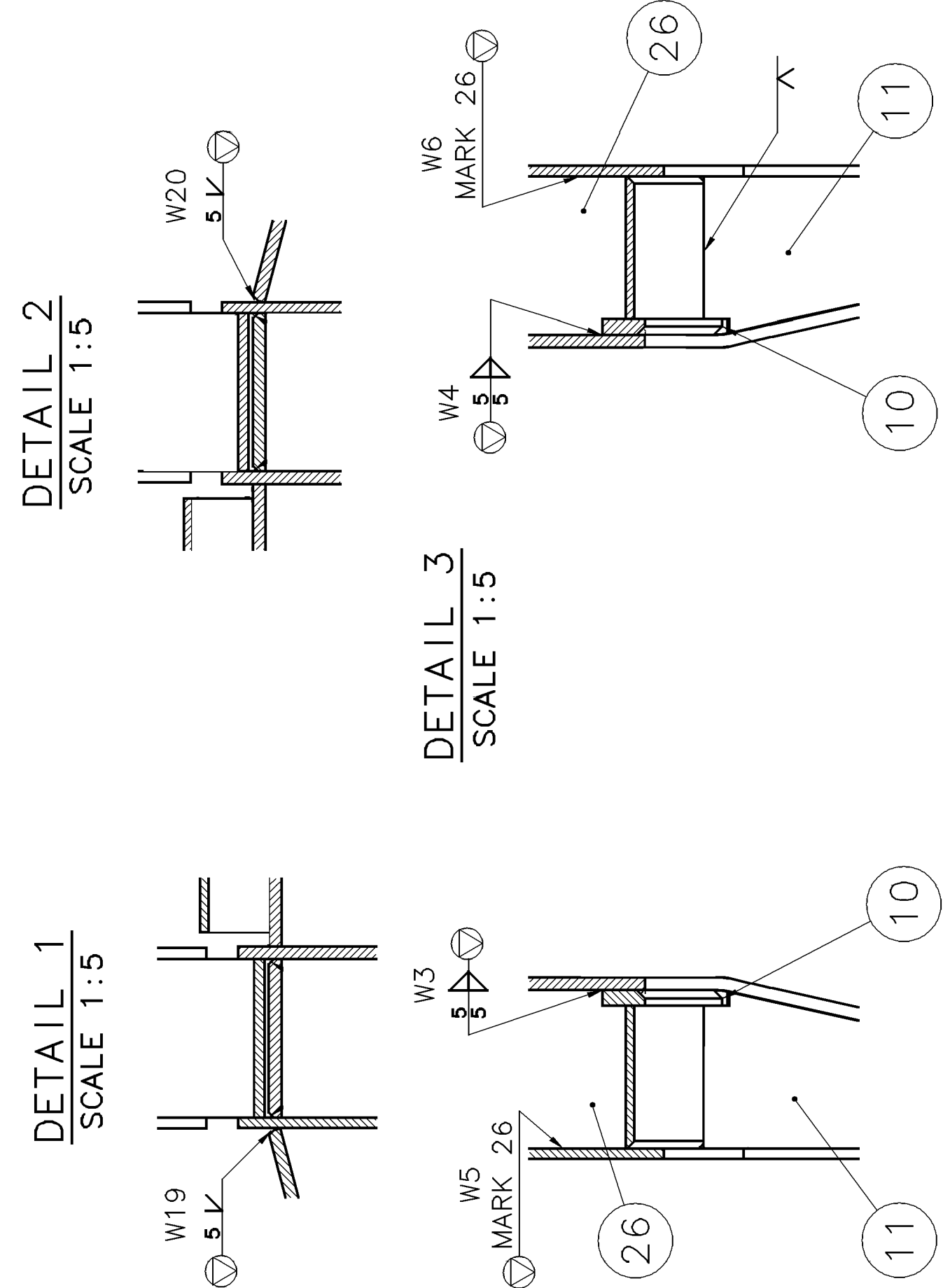
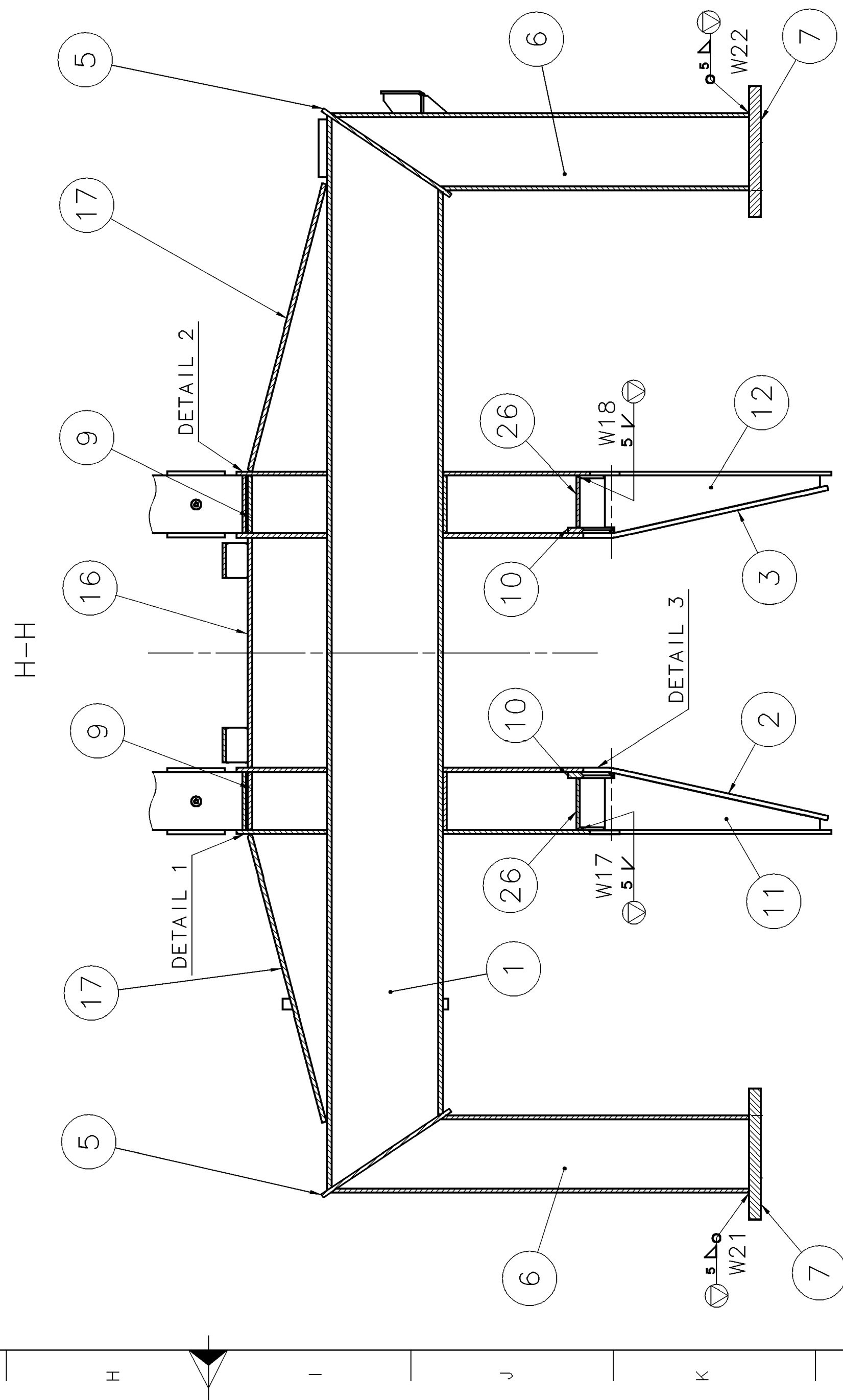
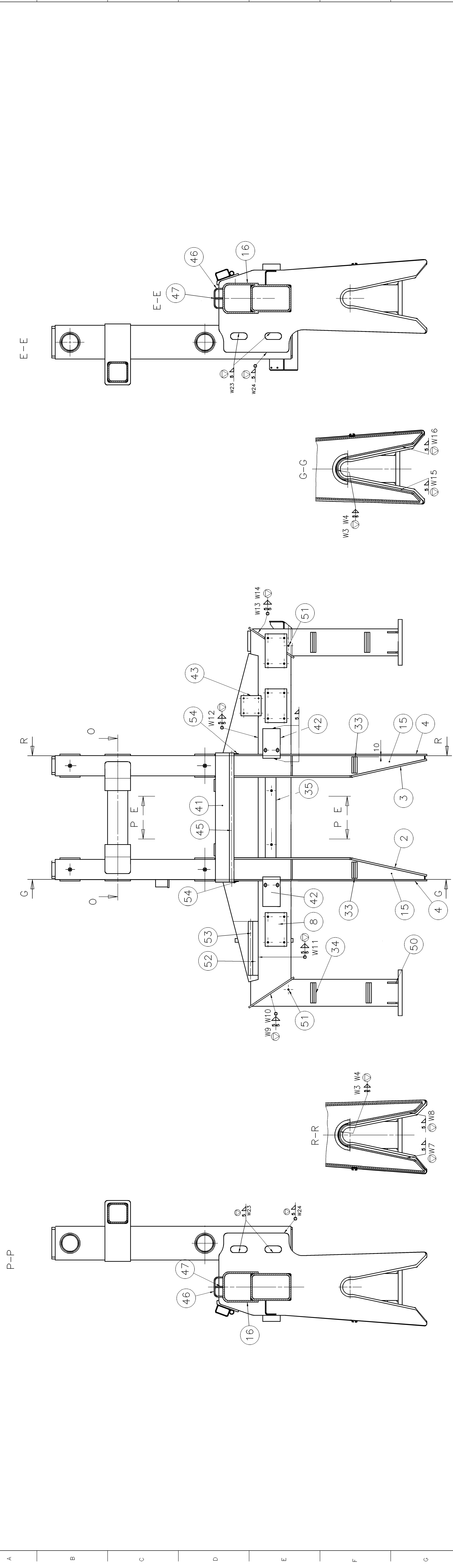
L

M

N

O

P

[illegible][illegible]

